PanaXSeries

The One to Watch for Constant Innovation-Making the Future Come Alive

MICROCOMPUTER MN101C00

MN101C00 Series C Source Code Debugger for Windows® User's Manual

Pub.No.11431-012E

Panasonic

MS-DOS is a registered trademark of Microsoft Corporation.
Windows is a trademark of Microsoft Corporation.
PanaXSeries is a trademark of Matsushita Electric Industrial Co., Ltd.
The other corporation names, logotype and product names written in this book are trademarks or registered trademarks of their corresponding corporations.

Request for your special attention and precautions in using the technical information and semiconductors described in this book

(1) An export permit needs to be obtained from the competent authorities of the Japanese Government if any of the products or technologies described in this book and controlled under the "Foreign Exchange and Foreign Trade Law" is to be exported or taken out of Japan.

(2) The contents of this book are subject to change without notice in matters of improved function. When finalizing your design, therefore, ask for the most up-to-date version in advance in order to check for any changes.

(3) We are not liable for any damage arising out of the use of the contents of this book, or for any infringement of patents or any other rights owned by a third party.

(4) No part of this book may be reprinted or reproduced by any means without written permission from our company.

If you have any inquries or questions about book or our semiconductors, please contact one of our sales offices listed at tha back of this book or Matsushita Electoronics Corporation’s Sales Department.

CONTENTS

Chapter 1. Overview

Chapter 2. Installation

Chapter 3. Using Debugger for First Time

Chapter 4. Creating User Program to Debug

Chapter 5. Window Commands

Chapter 6. Dialog Command Data Expressions

Chapter 7. Dialog Command Reference

Chapter 8. Appendices

INDEX

About This Manual

This manual is for those debugging software for the MN101C00 series. Chapters 1 through 3 describe the overall features of the C Source Code Debugger for Windows, installation, and loading for the first time. Chapter 4 outlines the procedure for preparing a C program for debugging. Chapter 5 contains detailed explanations of debugger windows, their on-screen elements, and operations. Chapters 6 covers data expressions for the dialog commands used in the [Command]. Chapter 7 is a command reference for dialog commands. Chapter 8 contains three appendices covering the in-circuit emulator specifications, interface board settings, and error messages.

Finding Information

This manual provides four different aids for rapidly finding necessary information.

(1) The thumbnail index at the front of the manual indicates the beginnings of chapters.

(2) The table of contents at the front of the manual lists sections by title.

(3) The upper right hand corner of right hand pages gives the chapter title; the bottom of each page, the section title. Together these give you an overview of the information available as you flip through the pages.

(4) The index at the back of the manual provides references by keywords.

Related Manuals

In addition to this manual, the following manuals are available for the MN101C00 series.

MN101C00 Series Installation Manual

MN101C00 Series LSI User's Manual

(Description of device hardware)

MN101C00 Series Instruction Manual

(Description of instruction set)

MN101C00 Series C Compiler User's Manual: Usage Guide

(Description of installation, loading, and options)

MN101C00 Series C Compiler User's Manual: Language Description

(Description of compiler's C implementation)

MN101C00 Series C Compiler User's Manual: Library Reference

(Description of standard library functions included with the compiler)

MN101C00 Series Cross Assembler User's Manual

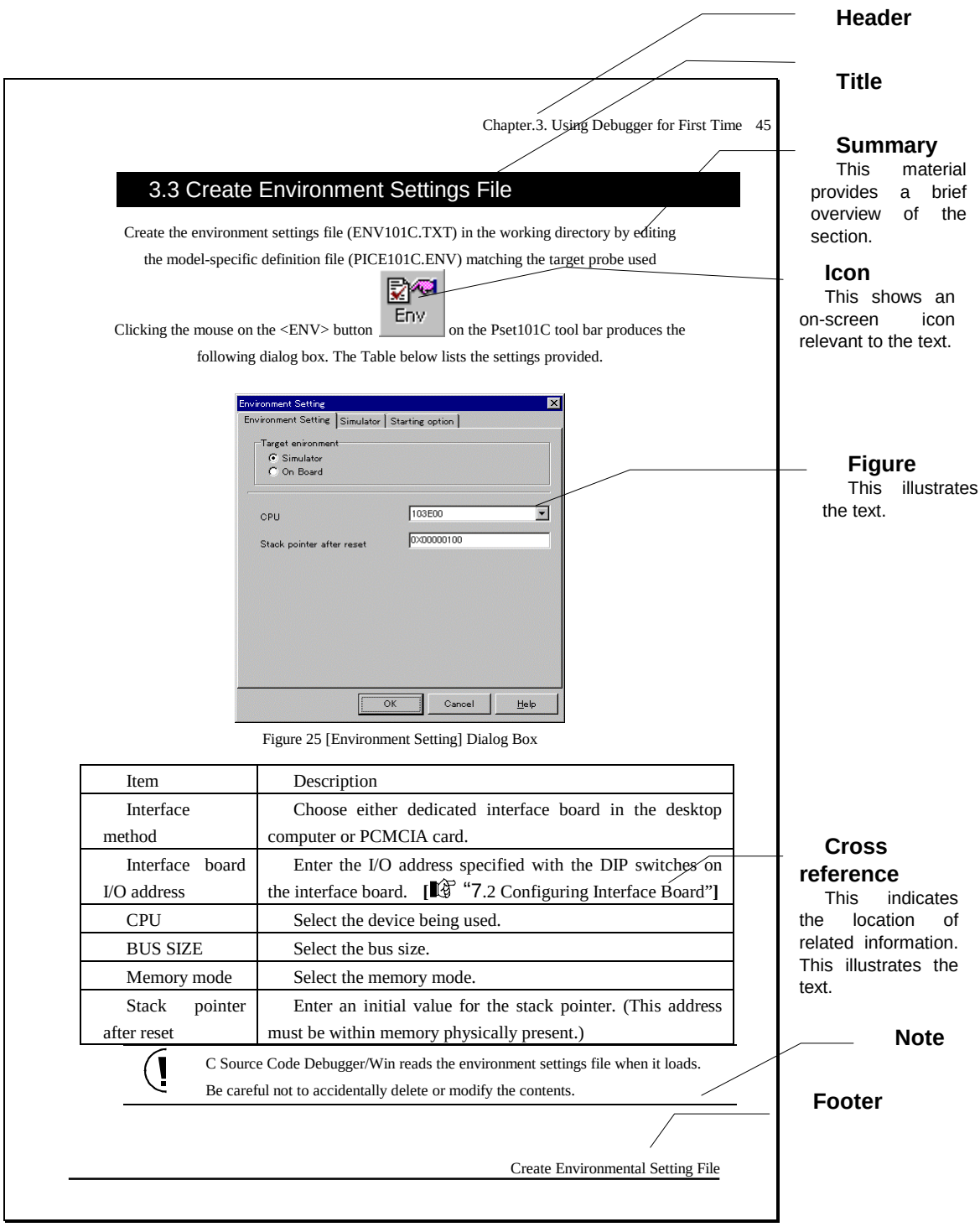
(Description of assembly language syntax and notation)

Contact

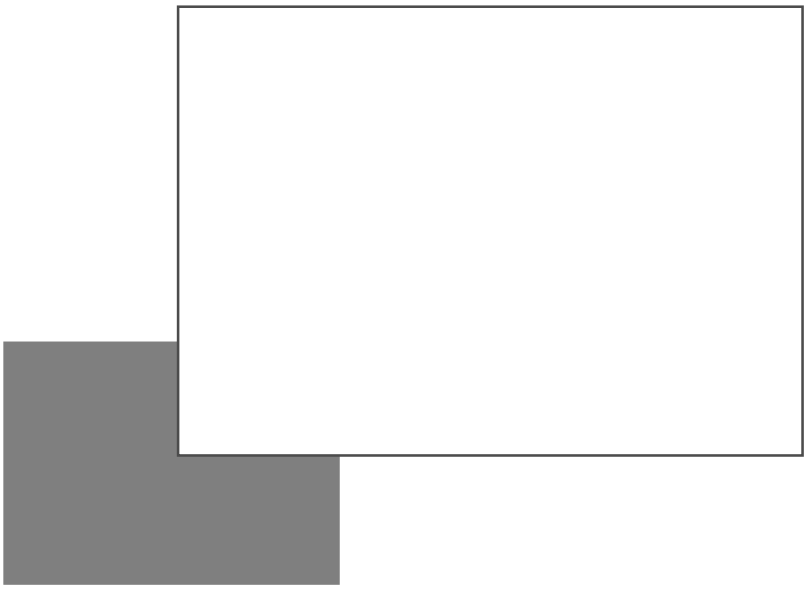
If you have any questions related to the contents of this manual, direct them to your nearest Matsushita Semiconductor Design Center. (The Centers are included in the list of sales offices appearing at the end of this manual.)

Page Layout

The contents of this manual may be roughly divided into the following parts: titles, summaries, main text, notes, and comments. The fifures accompanying the summaries are screen shots of operation under Windows 95.


Header
Title
Summary
This material provides a brief overview of the section.
Icon
This shows an on-screen icon relevant to the text.
Figure
This illustrates the text.
Cross reference
This indicates the location of related information. This illustrates the text.
Note
Footer
Chapter.3. Using Debugger for First Time 45
3.3 Create Environment Settings File
Create the environment settings file (ENV101C.TXT) in the working directory by editing the model-specific definition file (PICE101C.ENV) matching the target probe used
Clicking the mouse on the <ENV> button Env on the Pset101C tool bar produces the following dialog box. The Table below lists the settings provided.
Environment Setting
Environment Setting | Simulator | Starting option
Target environment
Simulator
On Board
CPU
103E00
Stack pointer after reset
0X00000100
OK
Cancel
Help
Figure 25 [Environment Setting] Dialog Box
Item | Description
Interface method | Choose either dedicated interface board in the desktop computer or PCMCIA card.
Interface board I/O address | Enter the I/O address specified with the DIP switches on the interface board. [“7.2 Configuring Interface Board”]
CPU | Select the device being used.
BUS SIZE | Select the bus size.
Memory mode | Select the memory mode.
Stack pointer after reset | Enter an initial value for the stack pointer. (This address must be within memory physically present.)
C Source Code Debugger/Win reads the environment settings file when it loads.
Be careful not to accidentally delete or modify the contents.
Create Environmental Setting File

CONTENTS



CONTENTS

CHAPTER 1. OVERVIEW 13

1.1 Features 14
1.1.1 Enhanced Features 14
1.1.2 Powerful Data Display/Editing Functions 14
1.1.3 Tool Bar 14
1.1.4 User Customization 14
1.1.5 On-the-Fly Support 15
1.1.6 Macros 15
1.1.7 Trace Functions 15
1.1.8 Performance Evaluation Functions 15

1.2 Important Notes 16
1.2.1 Hardware 16
1.2.2 Software 17
1.2.3 ROM and RAM 17
1.2.4 [Go], [Step], and [Come] Commands 17
1.2.5 Breakpoints 18
1.2.6 Tracing 18
1.2.7 On-the-Fly Support 19
1.2.8 Miscellaneous 19

1.3 Basic Operating Procedure 20

CHAPTER 2. INSTALLATION 25

2.1 Preparing for Installation 26
2.1.1 Install Interface Board 26
2.1.2 Connect In-Circuit Emulator 26
2.1.3 Back Up Floppy Disks 26
2.1.4 Start Windows 26

2.2 Installation 27
2.2.1 Read README.WRI 27
2.2.2 Run Installation Program 27
2.2.3 Windows V3.1 Installation 28
2.2.4 Windows 95 Installation 30
2.2.5 Specify Installation Directories 32

2.2.6 Copying Files....33
2.2.7 Interrupting Installation....34

CHAPTER 3.USING DEBUGGER FOR FIRST TIME....35

3.1 Set Up Environment with Pset101C....36
3.1.1 Load Pset101C....37

3.2 Check Files....43
3.2.1 Files Necessary for Loading....43
3.2.2 Files Saved at Exit....44
3.2.3 Other Files....44

3.3 Create Environment Settings File....45

3.4 Specify Starting Options....46
3.4.1 Specifying Starting Options via Dialog Box....46
3.4.2 Specifying Starting Options via Command Line....47

3.5 Load the Debugger....50
3.5.1 Debugger Loads Normally....50
3.5.2 Debugger Does Not Load....51

CHAPTER 4.CREATING USER PROGRAM TO DEBUG....53

4.1 Convert to ROM....54

CHAPTER 5. WINDOW COMMANDS....57

5.1 Screen Layout....58
5.1.1 Structural Elements....58
5.1.2 Screen Display....60

5.2 Menus....61
5.2.1 [File] Menu....61
5.2.2 [Edit] Menu....62
5.2.3 [Search] Menu....63
5.2.4 [View] Menu....63
5.2.5 [Run] Menu....64
5.2.6 Local Menus for Individual Windows....65
5.2.7 [Window] Menu....69
5.2.8 [Options] Menu....70
5.2.9 [Help] Menu....70

5.3 Shortcut Keys....71

5.3.1 Shortcut Keys Available in All Windows 71
5.3.2 Window-Specific Shortcut Keys 73
5.4 Mouse Operations 74
5.4.1 Mouse Operations Available in All Windows 74
5.4.2 Window-Specific Mouse Operations 75
5.5 [Code] Window 76
5.5.1 [Code] Window Shortcut Keys 77
5.5.2 [Code] Window Local Menu 79
5.5.3 [Code] Window Mouse Operations 80
5.6 [Command] Window 81
5.6.1 [Command] Window Shortcut Keys 81
5.6.2 [Command] Window Local Menu 83
5.7 [Memory] Window 84
5.7.1 [Memory] Window Shortcut Keys 84
5.7.2 [Memory] Window Local Menu 85
5.7.3 [Memory] Window Mouse Operations 85
5.8 [Register] Window 86
5.8.1 [Register] Window Shortcut Keys 86
5.8.2 [Register] Window Local Menu 87
5.8.3 [Register] Window Mouse Operations 87
5.9 [Stack] Window 88
5.9.1 [Stack] Window Shortcut Keys 88
5.9.2 [Stack] Window Local Menu 88
5.10 [Local] Window 89
5.10.1 [Local] Window Shortcut Keys 89
5.10.2 [Local] Window Local Menu 90
5.10.3 [Local] Window Mouse Operations 90
5.11 [BackTrace] Window 91
5.11.1 [BackTrace] Window Shortcut Keys 91
5.11.2 [BackTrace] Window Local Menu 92
5.11.3 [BackTrace] Window Mouse Operations 92
5.12 [Watch] Window 93
5.12.1 [Watch] Window Shortcut Keys 93
5.12.2 [Watch] Window Local Menu 94
5.12.3 [Watch] Window Mouse Operations 94
5.13 [Break] Window 95

5.13.1 [Break] Window Shortcut Keys 95
5.13.2 [Break] Window Local Menu 96
5.13.3 [Break] Window Mouse Operations 97

5.14 [Trace] Window 98
5.14.1 [Trace] Window Shortcut Keys 98
5.14.2 [Trace] Window Local Menu 99

5.15 [Inspect] Window 100
5.15.1 [Inspect] Window Shortcut Keys 100
5.15.2 [Inspect] Window Local Menu 101
5.15.3 [Inspect] Window Mouse Operations 101

5.16 [Memo] Window 102
5.16.1 [Memo] Window Shortcut Keys 102
5.16.2 [Memo] Window Local Menu 103

5.17 [RAM Monitor] Window 104
5.17.1 [RAM Monitor] Window Shortcut Keys 104
5.17.2 [RAM Monitor] Window Local Menu 105

5.18 Tool Bar 106
5.18.1 Tool Bar Configuration 106
5.18.2 Button Functions 107

5.19 Window Bar 109

5.20 Status Bar 110

5.21 Dialog Boxes 111
5.21.1 [File Open] Dialog Box 111
5.21.2 [Font] Dialog Box 112
5.21.3 [Tool Bar] Dialog Box 112
5.21.4 [Color] Dialog Box 113
5.21.5 [Find String] Dialog Box 113
5.21.6 [Set Inspect data] Dialog Box 114
5.21.7 [Set Watch data] Dialog Box 114
5.21.8 [Module] Dialog Box 115
5.21.9 [Set line no.] Dialog Box 115
5.21.10 [Addressing (Code/RAM Monitor)] Dialog Box 116
5.21.11 [Command History] Dialog Box 116
5.21.12 [Expand Symbol] Dialog Box 117
5.21.13 [Addressing(Memory)] Dialog Box 117
5.21.14 [Set Data] Dialog Box 118
5.21.15 [Register] Dialog Box 118

5.21.16 [Flags] Dialog Box 119
5.21.17 [Event] Dialog Box....119
5.21.18 [Hardware Breakpoint] Dialog Box....120
5.21.19 [Set Software Breakpoint] Dialog Box 120
5.21.20 [Jump Frame no.] Dialog Box 121
5.21.21 [Area Events] Dialog Box....121
5.21.22 [Area Breakpoint] Dialog Box....122
5.21.23 [Additional Options] Dialog Box....122

CHAPTER 6.DIALOG COMMAND DATA EXPRESSIONS 123

6.1 Data Expressions....124
6.1.1 Symbols 124
6.1.2 Global Symbols 124
6.1.3 Local Symbols 125
6.1.4 Predefined Symbols....126
6.1.5 Numerical Values 126
6.1.6 Addresses....126
6.1.7 Line Numbers 127
6.1.8 Strings....128
6.1.9 Register Names....128
6.1.10 Arithmetic Expressions....129

6.2 Data Expressions Using C Syntax....131
6.2.1 C Expressions 131
6.2.2 C Variables 132
6.2.3 Scope of C Variables 133
6.2.4 Constants 133
6.2.5 Operators 134
6.2.6 Expressions with Side Effects....135

CHAPTER 7. DIALOG COMMAND REFERENCE..... 137

7.1 Command Description Conventions....138

7.2 Commands Grouped by Function....139
7.2.1 Loading User Program....139
7.2.2 Running User Program 139
7.2.3 Breakpoint Commands....139
7.2.4 Area Event Commands 140
7.2.5 Real-Time Tracing Commands....140

7.2.6 Hardware-Related Commands 141
7.2.7 Displaying/Modifying Registers 142
7.2.8 Displaying/Modifying Memory 142
7.2.9 Assemble Command 143
7.2.10 Radix Command 143
7.2.11 Displaying Expressions 143
7.2.12 Reading/Writing Files 143
7.2.13 System Commands 143
7.2.14 Displaying/Modifying Symbols 144
7.2.15 Displaying Code 144
7.2.16 Displaying/Modifying C Data 144
7.2.17 Setting Options 145
7.2.18 Memo Commands 145
7.2.19 Logging/Running Batch Commands 145
7.2.20 Screen Control/Miscellaneous Commands 145
7.2.21 Predefined Symbols 146
7.2.22 Macro Commands 146

CHAPTER 8. APPENDICES 147

8.1 In-Circuit Emulator Specifications 148
8.1.1 Functional Specifications 148
8.1.2 Electrical Specifications 149
8.1.3 Environment Specifications 149
8.1.4 External Dimensions 149
8.2 Configuring Interface Board 150
8.2.1 Interface Board for PC/AT 151
8.3 Error Messages 152

INDEX 159

Preface

Overview

Thank you for purchasing the MN101C00 Series C Source Code Debugger for Windows (hereinafter referred to as "C Source Code Debugger/Win"), Windows-based control software for the PanaXSeries in-circuit emulator. This update to the MN101C00 Series C Source Code Debugger retains backward compatibility with the MS-DOS version while adding new features made possible by Windows: more debugging information, a multiwindow interface, pull-down menus, a convenient tool bar, and extensive on-line help. We are certain that you will find it a highly effective tool for continued use.

About This Manual

The manual set for the software consists of the MN101C00 Series Installation Manual and the MN101C00 Series C Source Code Debugger for Windows User's Manual (hereinafter referred to as the "C Source Code Debugger/Win User's Manual").

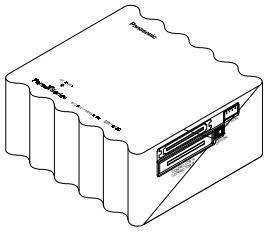
This manual, the C Source Code Debugger/Win User's Manual, details the setup and operation procedures for the software.

For further details on dialog commands entered via the [Command] window, see the on-line help.

Package Contents

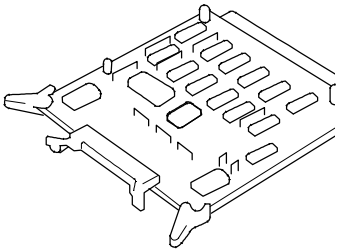
The development environment consists of the following components. Check that you have received all components and examine them for damage during shipment. If there are any problems, contain your nearest Matsushita Sales Office.

In-Circuit Emulator



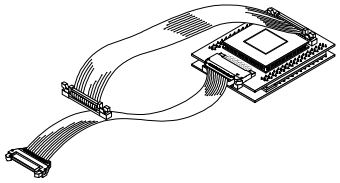
The in-circuit emulator features a single switch, for power, and an LED that lights when the power is on. It is controlled as a device within the host computer's I/O space.

Interface Board



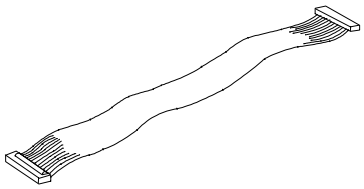
This dedicated interface board connects the in-circuit emulator to the personal computer. The illustration shows the version for the NEC PC-9801 series. Also available are a IBM PC/AT compatible version, and a PCMCIA card version.

Target Probe



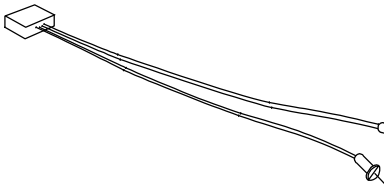
This probe connects the in-circuit emulator to the target board. The exact shape depends on the microcomputer model. The in-circuit emulator will not operate without this probe.

34-Lead Flat Cable (1.5 m)



This cable connects the in-circuit emulator to the dedicated interface board in the host computer.

Option Probe



The option probe supplies the target probe with power to confirm the booting of the in-circuit emulator. Use the option probe's power supply only for this purpose.

Floppy Disk

The package contains two floppy disks, labeled "Setup Disk" and "Disk 2." Always use the setup program on the former to install C Source Code Debugger/Win.

Manuals

MN101C00 Series C Source Code Debugger for Windows User's Manual (this manual)

This manual gives the procedures for installing the software and using it under Windows.

MN101C00 Series Installation Manual

This manual gives the procedures for connecting the in-circuit emulator, installing and configuring the interface board, and connecting to a PanaXSeries device.

Operating Environment

This section describes the hardware and software necessary for installing the C Source Code Debugger/Win package. Before proceeding to the actual installation, check your hardware and software.

Necessary Hardware

Personal Computer and Memory

The package requires a personal computer that has a CPU that is an 80386 or better, has at least eight megabytes of memory, runs either Windows V3.1 or Windows 95, and contains an expansion bus matching the specifications of the in-circuit emulator's dedicated interface board.

Display

The display can be either external or built into the personal computer, but it must support Windows V3.1 or Windows 95.

Hard Disk

C Source Code Debugger/Win requires a hard disk with at least five megabytes of free space.

Floppy Disk Drive

Setting up C Source Code Debugger/Win requires at least one floppy disk drive. This drive must match the specifications of the floppy disks included with the package.

Mouse

To derive the full benefit of C Source Code Debugger/Win's many features, you must have a Windows V3.1/Windows 95-compatible mouse attached to your personal computer.

Necessary Software

MS-DOS

The Windows V3.1 version requires that the MS-DOS be running on the computer used. The Windows 95 version runs under both English- and Japanese-language versions of the operating system.

Windows

The package requires Windows 95 or Windows V3.1. Before starting the C Source Code Debugger/Win installation procedure, make sure that Windows is running on the computer.

Typographical Conventions

This manual uses the following typographical conventions.

[Menu]	Menu names are enclosed in square brackets.
[Menu]-[Command]	Commands are also shown in square brackets and preceded with the name of the menu on which they appear.
[Dialog]	Dialog boxes are also shown in square brackets.
<Button>	Button names are shown in angle brackets.

On-Line Help

C Source Code Debugger/Win includes on-line help for on-screen viewing of explanations for functions and procedures. To display these help screens, press the End, type the HELP dialog command, select the [Help]-[Contents] command, or click the mouse on the <Help> button.

Chapter 1. Overview

1.1 Features

1.2 Important Notes

1.3 Basic Operating Procedure

1.1 Features

C Source Code Debugger/Win incorporates many features to make work easier for the developer.

1.1.1 Enhanced Features

Users of the MS-DOS version should have no trouble making the transition since most keyboard operations (including function keys) for the [Code] and [Command] windows are the same. The software has been enhanced, however, with such standard Windows features as pull-down menus, scroll bars, a tool bar, and on-line help. Setting up such complex operations as a hardware breakpoint or a real-time trace involves only simple mouse operations within the corresponding dialog box.

1.1.2 Powerful Data Display/Editing Functions

This new version features greatly enhanced facilities for displaying and editing data. Moving the mouse cursor to a variable, array, or bit value in a [Code] window and double-clicking, for example, is all that it takes to open the [Inspect] window for viewing and editing the corresponding data in the appropriate data structure. Data display/editing is equally easy in the [Watch], [Local], [Register], and [Memory] windows.

1.1.3 Tool Bar

Buttons on the user-configurable tool bar provide instant access, with a single mouse click, to such frequently used commands as those for loading the user program to be debugged, running it, and inspecting a variable.

1.1.4 User Customization

The tool bar, text fonts, display colors, window layouts, etc. are all freely configurable. Up to three window layouts may be defined.

1.1.5 On-the-Fly Support

On-the-fly support allows you to set breakpoints, specify/display traces, and display/edit data in RAM without stopping the user program. You can thus debug without halting operation of the target CPU.

1.1.6 Macros

The debugger supports a macro language with such C-like control structures as if, for, while, and do. Macros combine multiple commands into a single new command. Together with breakpoints, they greatly improve debugging efficiency.

1.1.7 Trace Functions

These functions update the display of trace memory contents every machine cycle as the user program executes.

1.1.8 Performance Evaluation Functions

C Source Code Debugger/Win includes a profiler for determining the functions where the user program spends most of its time and a [RAM Monitor] window for displaying the contents of RAM on the screen as the user program executes.

1.2 Important Notes

This section lists important things to watch out for when using the in-circuit emulator.

1.2.1 Hardware

- The pins on the probe are precision parts that must be protected from physical shocks. When storing the probe, cover the connectors with the caps provided.
- Do not touch the surface of the interface board or the circuit board inside the in-circuit emulator.
- The emulator only supports separately excited oscillation (OSC, XI) for the target.
- There is a certain amount of error in execution time measurements over extended periods.

The in-circuit emulator does not operate properly under the following conditions.

- The clock is supplied by the target, and the clock waveform either does not have the proper levels or contains excessive noise.
- The power to the target is off.
- The bus request signal from the target is active for longer than a specific interval (approximately 0.1 seconds).
- The reset signal from the target is active for longer than a specific interval (approximately 0.1 seconds).
- The target is operating in the handshake mode, and the NDK signal from the target does not become active within a specific interval.
- The NDEAD signal from the target is active for longer than a specific interval (approximately 0.1 seconds).

1.2.2 Software

- After installing the software on the hard disk, put the floppy disks away in a safe place for use as master disks. Backing up the C Source Code Debugger/Win disks for purposes of maintenance and security is the only type of copying permitted. Backups can be made with such commands as the MS-DOS DISKCOPY and COPY commands.
- Add an extra ten bytes to the program user stack for use by the monitor program.

1.2.3 ROM and RAM

- The addresses from 38000H through to the end of the 256-kilobyte address space are not available for use as emulation memory.
- The D, E, U, and other commands cannot display or modify data in the expanded ROM area if that is assigned to the target.

1.2.4 [Go], [Step], and [Come] Commands

- The microcomputer does not accept interrupts during [Step] command execution.
- The [Go], [Step], and [Come] commands are not available when the microcomputer is in STOP or HALT mode.
- Add an extra ten bytes to the program user stack for use by the monitor program. This stack must be in either the RAM emulation memory or the RAM on the target.
- TI, the in-circuit emulator's command for measuring execution time, does not give correct results during single-step execution.

1.2.5 Breakpoints

- Setting a software breakpoint to a byte other than an opcode replaces the operand with the PI code (0xFF).
- Since a software breakpoint stops execution just before the instruction specified as the breakpoint, you cannot specify a count.
- A hardware breakpoint stops after executing one or two instructions after the instruction specified as the breakpoint. The exact number depends on the instruction sequence. Since a ROM hardware breakpoint is based on the microcomputer's ROM read address, there are sometimes breaks at points other than the specified instruction.
- You cannot set breakpoints for the microcomputer's Auto Transfer Control (ATC) operation.
- You cannot set RAM breakpoints for data sizes word and long.
- When a trace full breakpoint is in effect, only forced breakpoints and software breakpoints are available.
- Setting a RAM area breakpoint in the stack area interferes with execution of the user program.

1.2.6 Tracing

- Using single-step operation clears the contents of the trace memory.
- When a trace full breakpoint is in effect or the number of steps traced is less than 511, tracing sometimes does not show the first and last instructions executed.
- Tracing does not show the first instruction executed.
- You cannot trace the microcomputer's Auto Transfer Control (ATC) operation.
- You cannot disassemble the trace if the microcomputer is in STOP or HALT mode or if the target board is in the middle of a reset.
- When the JSR instruction pushes the return address onto the stack, the trace sometimes does not show the result until the next instruction.
- Modifying an event while a direct trigger trace is in effect leads to faulty tracing.
- Specifying a trace full stop while the user program is running does not stop execution.

1.2.7 On-the-Fly Support

- Displaying or modifying data (e.g., displaying disassembler output) while the user program is running temporarily suspends execution. The maximum delay per byte is 5 machine cycles for access to the emulation memory and 500 machine cycles for access to the microcomputer's special registers or external memory on the target board. During this interval, the debugger displays the message "Warning: CPU STOPPED" on the status line.
- You cannot display/edit the contents of memory, the microcomputer's special registers, or external memory on the target board or disassemble the trace if the microcomputer is in STOP or HALT mode or if the target board is in the middle of a reset.
- Changing event settings while the user program is running clears all previous events.
- When the in-circuit emulator's RAM monitor and real-time watch functions read the monitor RAM contents, they do so within a 10-cycle period after the user program reads memory at a different address. The data cannot be displayed if the user program accesses that address during that interval. Neither can it be displayed if there is no access to a different address.

1.2.8 Miscellaneous

- There is a certain amount of error in execution time measurements over extended periods.
- Execution time measurements do not include the execution time for the first instruction.
- If the target is operating in the handshake mode, the in-circuit emulator does not issue acknowledge signals when the microcomputer accesses the external memory space. You must therefore provide a circuit or other mechanism for generating acknowledge signals for all external memory regions used.
- Note that the in-circuit emulator does not issue acknowledge signals even for accesses to external memory space regions assigned to the emulation memory inside the in-circuit emulator (with the EX command).

1.3 Basic Operating Procedure

This section describes the basic operating procedure for C Source Code Debugger/Win.

(1) Install software.

Install C Source Code Debugger/Win on the hard disk with the installation program.

[■☞"Chapter 2. Installation "]

(2) Set up environment

Set up the C Source Code Debugger/Win operating environment with Pset101C.

[■☞"3.1 Set Up Environment with Pset101C"]

There is a separate setup program for this purpose.

Figure 1. Environment Configuration Program Pset101C

(3) Load debugger.

After setting up the operating environment, load C Source Code Debugger/Win.

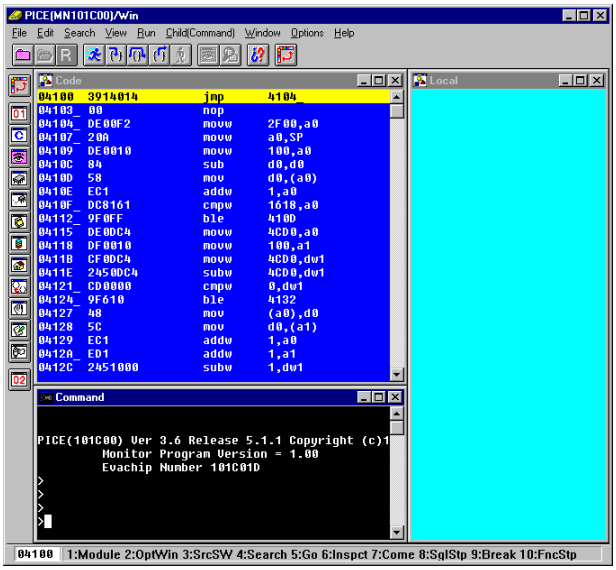

PICE(MN101C00)/Win
File Edit Search View Run Child(Command) Window Options Help
Code
Local
Command
PICE(101C00) Ver 3.6 Release 5.1.1 Copyright (c)1
Monitor Program Version = 1.00
Evachip Number 101C01D
04100 1:Module 2:OptWin 3:SrcSW 4:Search 5:Go 6:Inspct 7:Come 8:SqlStp 9:Break 10:FncStp

Figure 2. C Source Code Debugger/Win Starting Screen

(4) Load user program.

Load the user program to be debugged.

[☞ , L command, [File]-[Load] command]

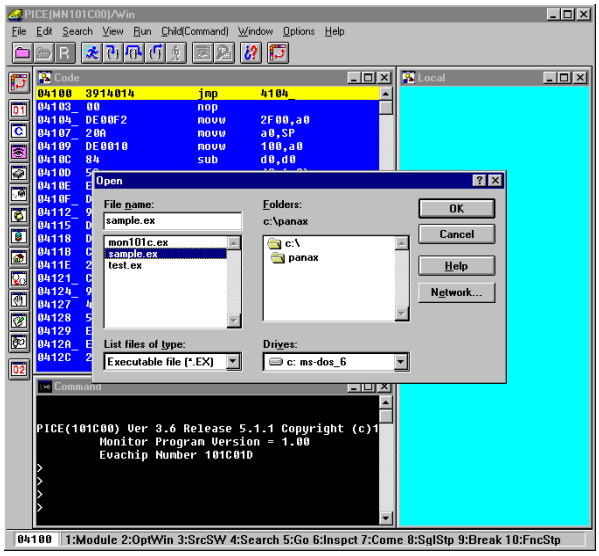


Figure 3. Loading Target Program

(5) Set breakpoint.

Click the mouse on the line number in a [Code] window to set a breakpoint at the corresponding address.

[☞"5.5.3 [Code] Window Mouse Operations," [Child(Break)]-[Add]]

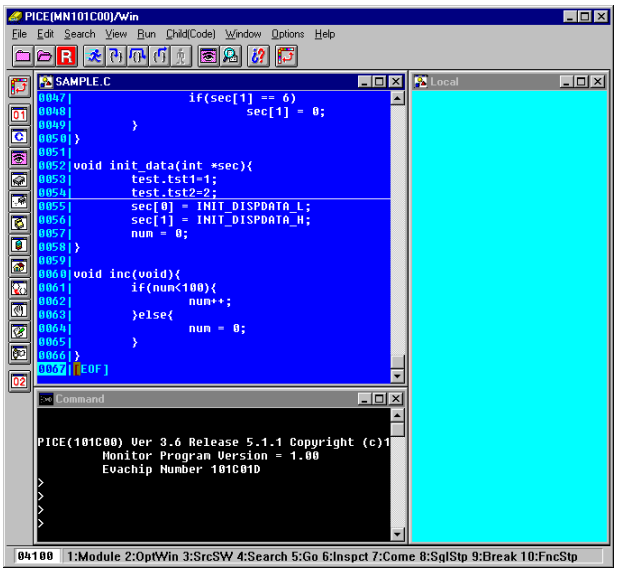

PICE(MN101C00)/Win
File Edit Search View Run Child(Code) Window Options Help
SAMPLE.C
Local
Command
PICE(101C00) Ver 3.6 Release 5.1.1 Copyright (c)1
Monitor Program Version = 1.00
Evachip Number 101C01D
1:Module 2:OptWin 3:SrcSW 4:Search 5:Go 6:Inspct 7:Come 8:SqlStp 9:Break 10:FncStp

Figure 4. Setting Breakpoint

(6) Run user program.

Run the user program and wait for it to stop at the breakpoint set in step 5. Alternatively, press the Esc key to force a halt.

[■☞,[Run]-[Run program],]

(7) Inspect variable.

Double-click the mouse on a variable to display its contents for editing in the [Inspect] window.

[■☞, "5.5.1 [Code] Window Shortcut Keys"]

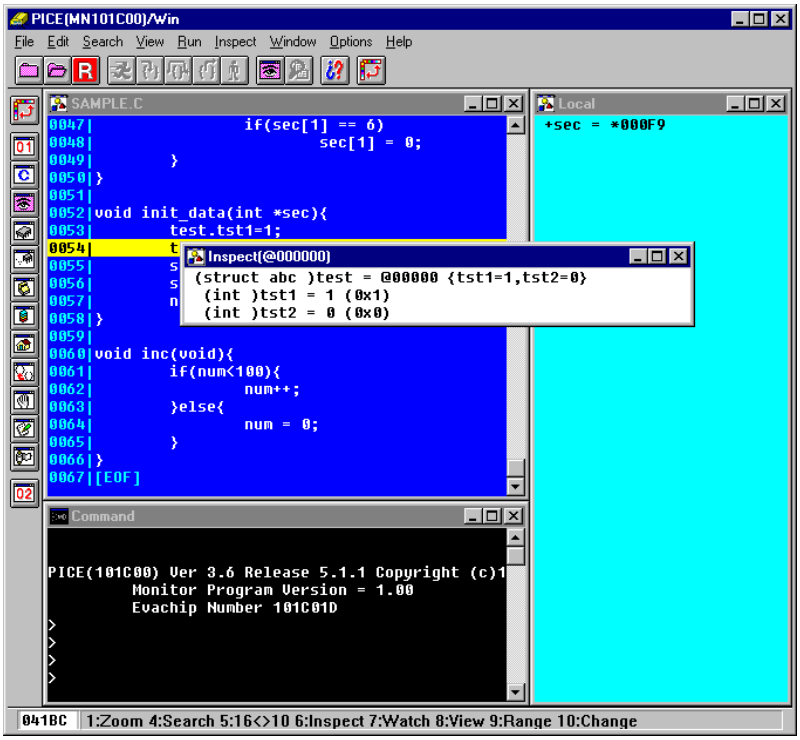


Figure 5. [Inspect] Window

(8) Add watch variable.

Add a variable to the [Watch] window.

[☞ , "5.5.1 [Code] Window Shortcut Keys"]

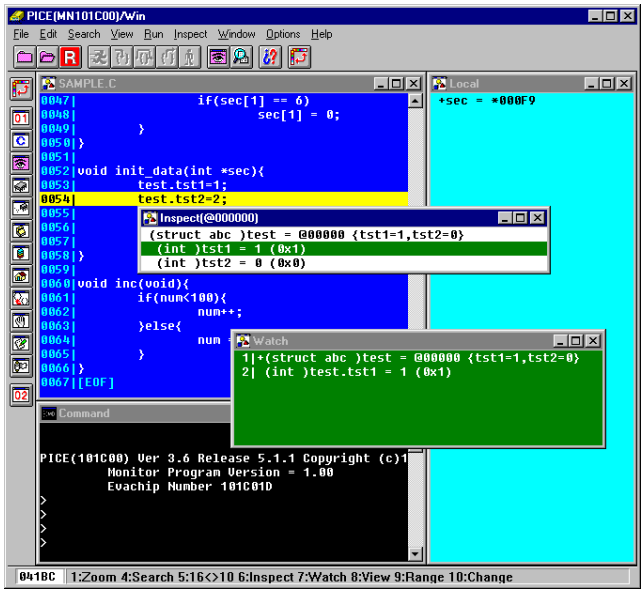


Figure 6. [Watch] Window

(9) Exit.

Exit C Source Code Debugger/Win.

[☞ , [File]-[Exit]]

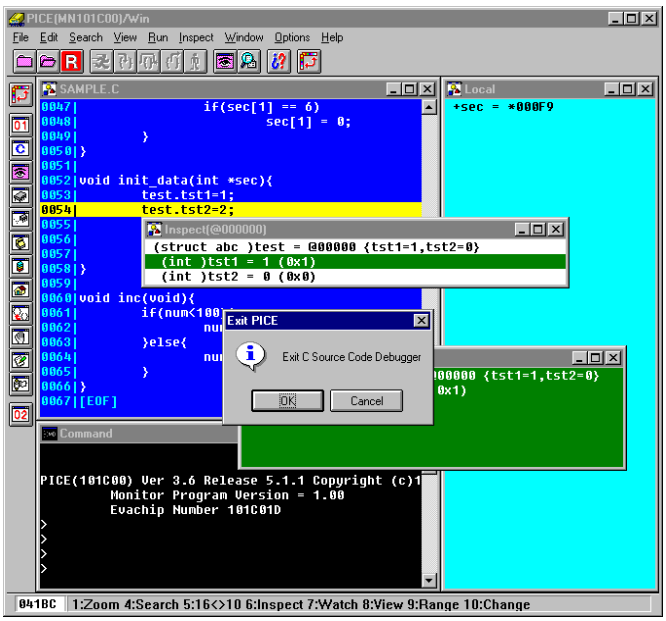


Figure 7. C Source Code Debugger/Win Exit Confirmation

Chapter 2. Installation

2.1 Preparing for Installation

2.2 Installation

2.1 Preparing for Installation

Before running the C Source Code Debugger/Win installation program, make sure that the host computer and the in-circuit emulator are properly connected. (You may postpone the steps in this section if you are only installing the software, however.)

2.1.1 Install Interface Board

Install the in-circuit emulator's dedicated interface board.

[■☞"8.2 Configuring Interface Board"]

2.1.2 Connect In-Circuit Emulator

1. Mount the interface board in an expansion slot inside the host computer.
2. Connect the interface board mounted in the computer to the in-circuit emulator with the 34-lead flat cable.
3. Connect the target probe to the in-circuit emulator.
4. Connect the option connector and the connector extending from the top of the QFP conversion board under the target probe with the option probe.

For further details on the connection procedure, see the MN101C00 Series Installation Manual.

2.1.3 Back Up Floppy Disks

After installing the software on the hard disk, put the floppy disks away as master copies. Backing up the C Source Code Debugger/Win disks for purposes of maintenance and security is the only type of copying permitted.

2.1.4 Start Windows

Confirm that Windows loads properly.

2.2 Installation

This section describes the procedures for running the installation program under Windows V3.1 or Windows 95.

The files for C Source Code Debugger/Win are stored on the floppy disks in a compressed format, so installing them involves more than simply copying them to the hard disk. Always use the C Source Code Debugger/Win installation program supplied on the first floppy disk.

2.2.1 Read README.WRI

The floppy disk may contain a README.WRI file containing additions to the manual, cautionary notes, and other late-breaking material. Be sure to read this file with Write, WordPad, or similar program before running the C Source Code Debugger/Win installation program.

2.2.2 Run Installation Program

The proper procedure for installing C Source Code Debugger/Win is to insert the floppy disk labeled "Setup Disk" and run the included installation program SETUP.EXE from Windows. If you are running Windows V3.1, proceed to Section 2.2.3. If you are running Windows 95, skip to Section 2.2.4.

2.2.3 Windows V3.1 Installation

From Program Manager

Insert the floppy disk labeled "Setup Disk" in the floppy disk drive.

Open the Program Manager's [Icon] menu and select the [Run...] command.

In the [Run...] dialog box that appears, enter the name of the drive containing the "Setup Disk" and the file name SETUP.EXE in the [Command line] text box.

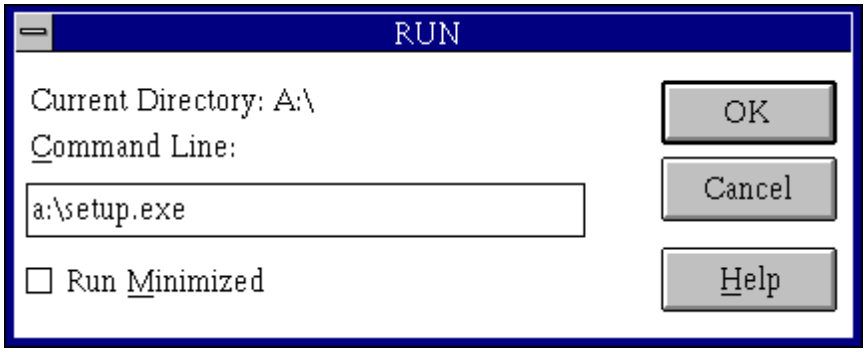


Figure 8. Running from [Run...] Dialog Box

Alternatively, click the mouse on the <Browse> button and select the name of the drive containing "Setup Disk" and the program name (setup.exe) in the [File Browser] dialog box that appears.

Click the mouse on the <OK> button to run the program.

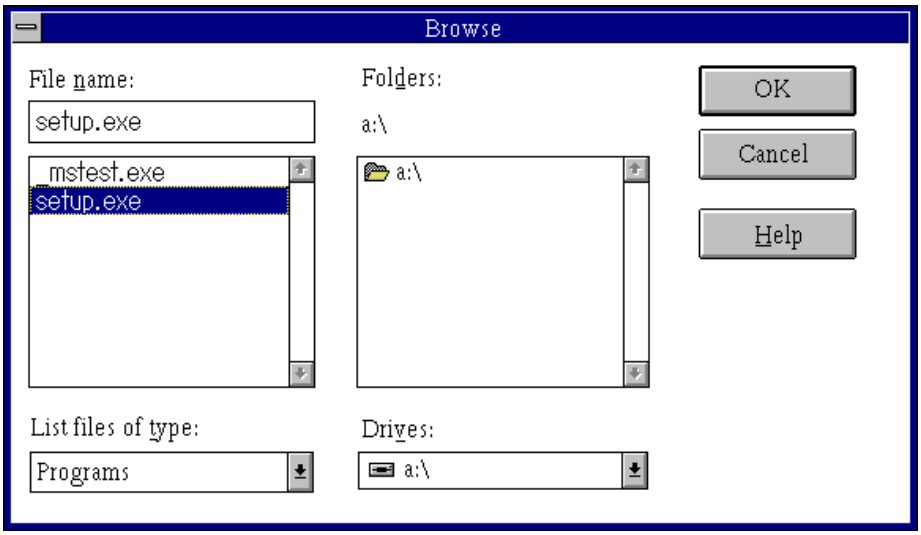


Figure 9. Running from [File Browser] Dialog Box

From File Manager

Insert the floppy disk labeled "Setup Disk" in the floppy disk drive.

Double-click the mouse on the icon labeled "File Manager" in the Program Manager's Main window. Select the [Select drive] command on File Manager's [Disk] menu.

Select the drive containing the floppy disk labeled "Setup Disk" in the [Drive] list box in the [Select Drive] dialog box.

Click the mouse on the <OK> button.

Select the icon labeled "setup.exe" in the [Directory] window.

Select the [Open] command on File Manager's [File] menu to run the program.

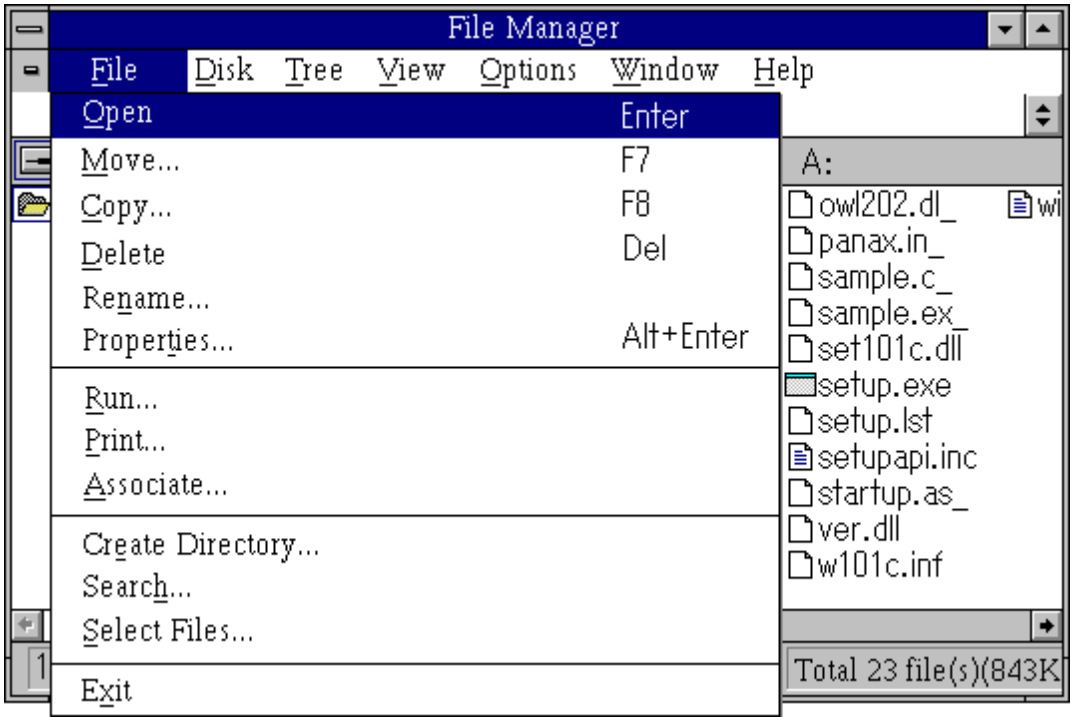


Figure 10. Running from File Manager

2.2.4 Windows 95 Installation

By Specifying File Name

Insert the floppy disk labeled "Setup Disk" in the floppy disk drive.

On the [Start] menu, select the [Run...] command.

In the [Run...] dialog box that appears, enter the name of the drive containing the "Setup Disk" and the file name (setup.exe) in the [Command line] text box.

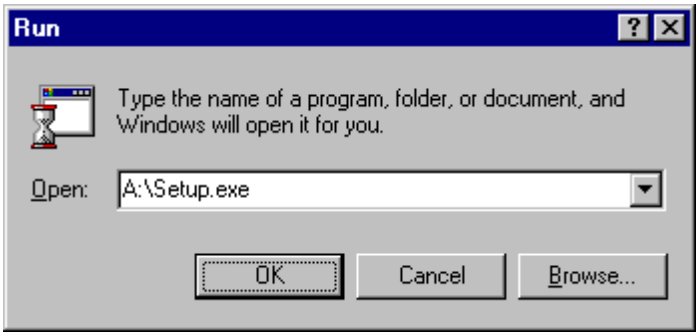


Figure 11. Running from [Run...] Dialog Box

Alternatively, click the mouse on the <Browse> button and select the name of the drive containing "Setup Disk" and the program name (setup.exe) in the [File Browser] dialog box that appears.

Click the mouse on the <OK> button to run the program.

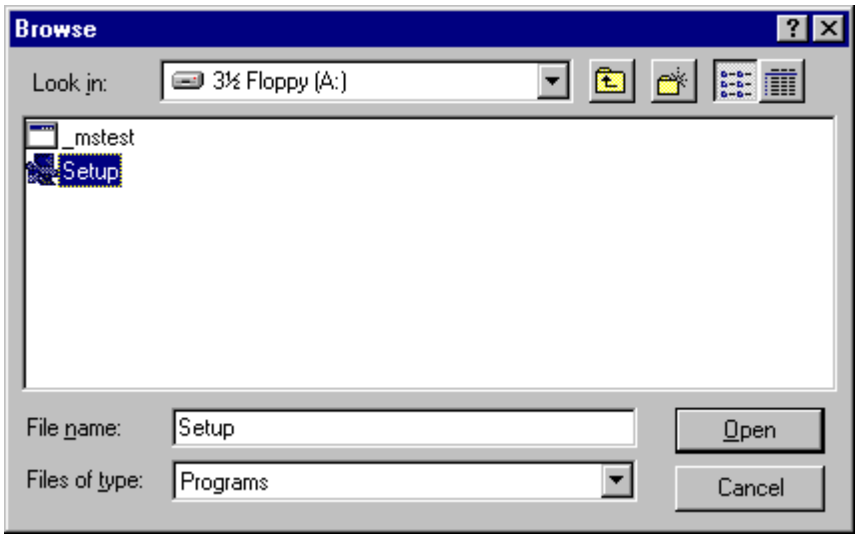


Figure 12. Running from [File Browser] Dialog Box

From Explorer

Insert the floppy disk labeled "Setup Disk" in the floppy disk drive.

On the [Start] menu, select [Programs] and then click the mouse on Explorer to run the program.

In the left panel showing the disk drives and folders, select the name of the drive containing the "Setup Disk": [Desktop]-[My Computer]-[3.5-inch floppy disk].

When the contents of the disk appear in the right panel, double-click the mouse on the icon labeled "Setup.exe" to launch the program.

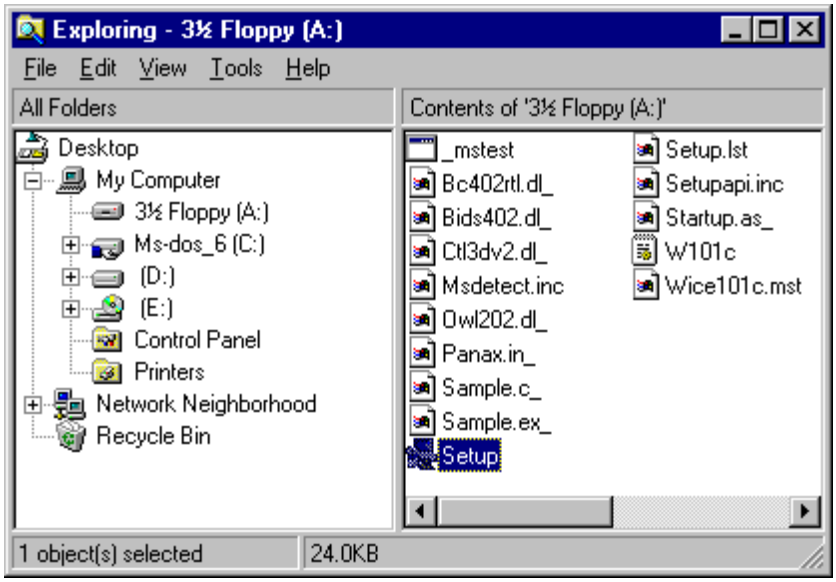


Figure 13. Running from Explorer

2.2.5 Specify Installation Directories

The installation program starts by asking for directories.(Figure 14)

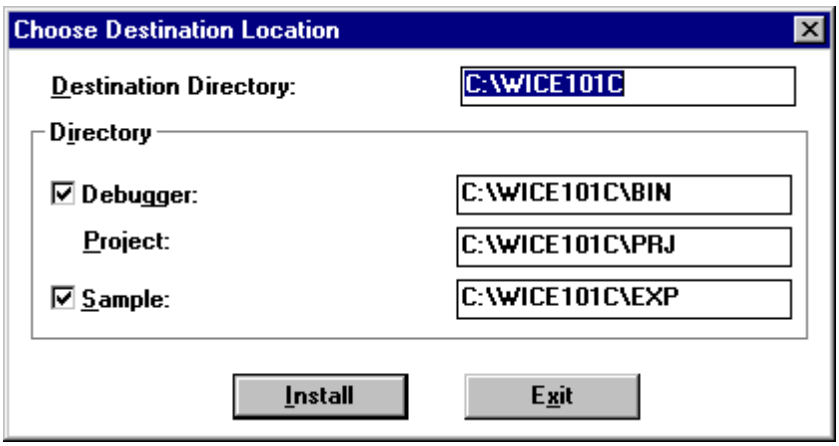


Figure 14. [Installation Directories] Dialog Box

To change directories for C Source Code Debugger/Win components, enter the path names from the keyboard.

Debugger	Specify the directory for installing the C Source Code Debugger/Win program files.
Projects	Specify the working directory.
Sample programs	Specify the directory for installing the sample programs.

If you do not wish to install a particular group of files, click the mouse on the check box next to it to erase the check mark. To restore the check mark, click the mouse a second time on the empty box.

Click the mouse on the <Install> button to start installation.

2.2.6 Copying Files

Clicking on the <Install> button starts file copying. After a while, a dialog box asks for the second disk. Change floppy disks and click the mouse on the <OK> button.

When it has finished copying the files, the program creates the PanaXSeries group in the Program Manager (Windows V3.1) or the [Start]-[Program] menu (Windows 95).

This completes the C Source Code Debugger/Win installation. Windows 95 displays the following window.

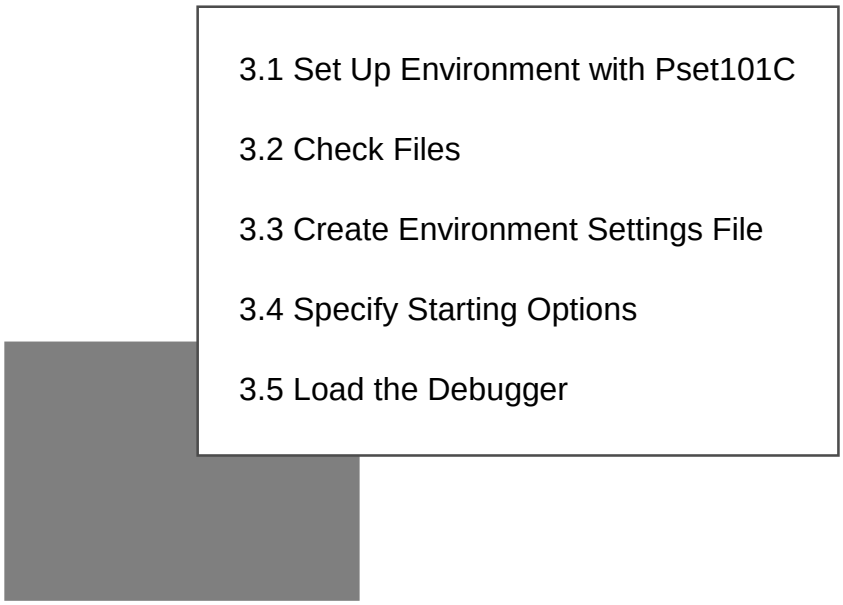
Figure 15. New PanaXSeries Group

When C Source Code Debugger/Win installation is complete, put the floppy disks away for safe keeping.

2.2.7 Interrupting Installation

You may exit the program when the [Installation Directories] dialog box is on the screen or the program is copying files. In the latter case, however, the program leaves the newly created directories on the hard disk. Before repeating the installation, remove these with Explorer, File Manager, or the DOS DEL command.

Chapter 3.Using Debugger for First Time


3.1 Set Up Environment with Pset101C
3.2 Check Files
3.3 Create Environment Settings File
3.4 Specify Starting Options
3.5 Load the Debugger

3.1 Set Up Environment with Pset101C

The installation program creates a new group called "PanaXSeries." Before you can load C Source Code Debugger/Win, however, you must specify certain environment settings. Double-click the mouse on the icon labeled "Pset101C" in the PanaXSeries group to load the program for doing so.

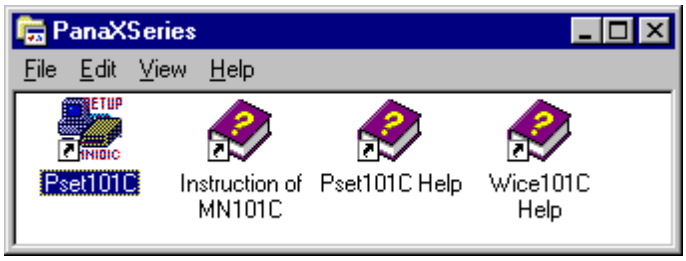


Figure 16. PanaXSeries Group

Configuring the C Source Code Debugger/Win operating environment consists of the following steps.

- Specifying a working directory (pages 38 and 40)
- Creating an environment settings file (pages 38 and 45)
- Specifying the starting options (pages 39, 41, and 46)
- Creating a shortcut (pages 39 and 41)
- Saving the setup (pages 39 and 42)

Correctly completing the above steps allows C Source Code Debugger/Win to load successfully. The icon labeled "Pset101C" is a utility for performing these setup operations.

3.1.1 Load Pset101C

The icon labeled "Pset101C" is a utility for setting up the C Source Code Debugger/Win operating environment.

Load it by double-clicking the mouse on the icon labeled "Pset101C" in the PanaXSeries group.

Figure 17. Pset101C Starting Screen

There are three possibilities, depending on whether you are creating a new environment, upgrading from the MS-DOS version of the debugger, or modifying an existing environment previously created with Pset101C.

If you are upgrading from the MS-DOS version of the debugger, skip to page 39.

If you are modifying an existing environment created with Pset101C skip to page 42.

Creating a New Environment

Select working directory.

Specify the directory for creating the new C Source Code Debugger/Win environment. The normal choice is the directory containing the C source files and object files for the project. You can, however, create a new directory if you wish.

To specify the directory, either enter its name in the [Directory] text box or select it in the [Directory] list box.

Clicking the mouse on the <OK> button causes the C Source Code Debugger/Win to copy the files that it needs to the specified directory.

Subsequent editing operations affect only the environment settings and starting options files in the specified directory.

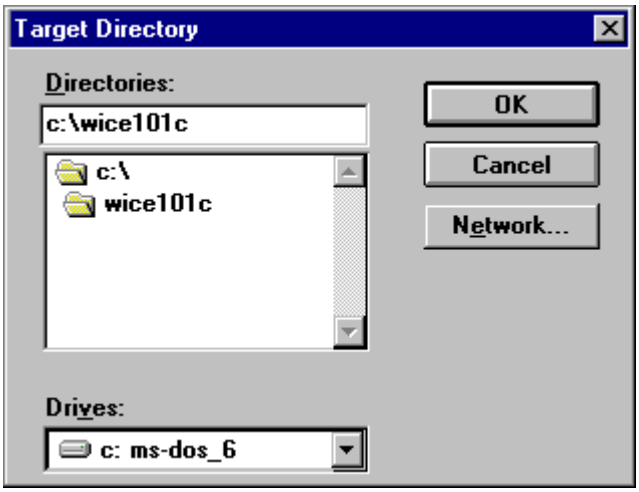


Figure 18. Specifying Working Directory

If the files necessary for loading are not present in the specified directory, C Source Code Debugger/Win will not load properly.

Create environment settings file.

Create the environment settings file (PICE101C.ENV) in the working directory by editing the model-specific definition file (ENV101C.TXT) matching the target probe used.

For further details on the items to be specified (interface board type, I/O port address, CPU type, bus size, stack pointer after a reset, and memory mode), see Section 3.3 "Creating Environment Settings File."

Specify starting options.

Specify the C Source Code Debugger/Win starting options. These options tell the debugger such things as the operating mode and memory configuration. For further details, see Section 3.4 "Specify Starting Options."

Create a shortcut.

Create a shortcut to the current C Source Code Debugger/Win setup by double-clicking the mouse on a group. Double-clicking the mouse on that icon then loads the debugger.

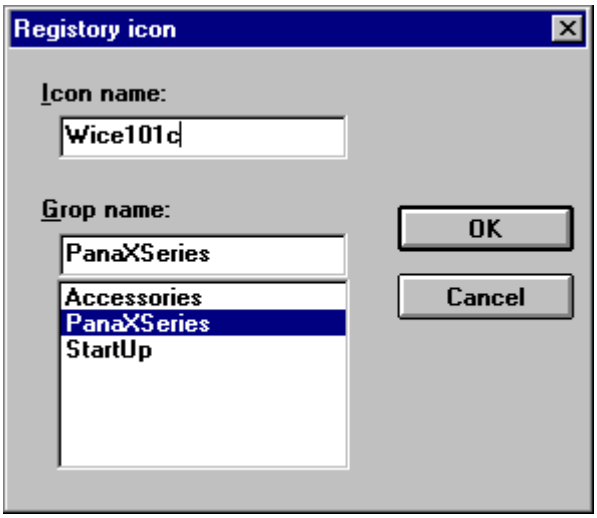


Figure 19. Creating Shortcut Labeled "WICE101C"

Save setup

Save the edited setup in the project file. The environment configuration program (the icon labeled "Pset101C") then automatically reads in these settings the next time that you run it. To modify the settings, use the procedures in "Modifying an Existing Environment" below.

Upgrading from MS-DOS Version

Select working directory.

Select as the directory for creating the C Source Code Debugger/Win environment the one already in use by the MS-DOS version of the debugger.

Clicking the mouse on the <OK> button produces the warning message box shown in Figure 21. Click the mouse on the <No> button to keep from overwriting your existing environment settings file (PICE101C.ENV) .

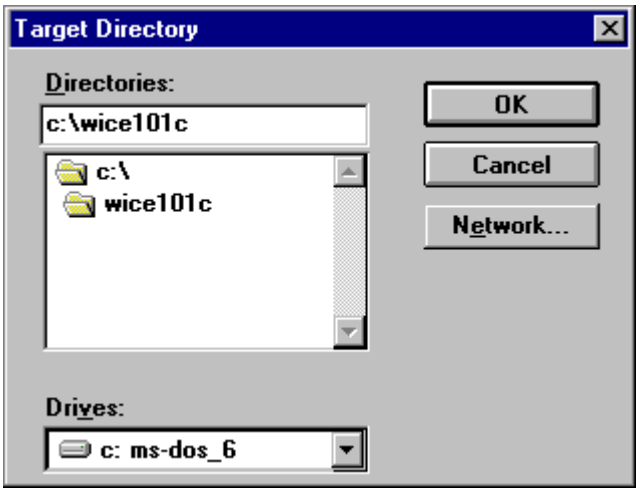


Figure 20. Specifying Working Directory

Figure 21. [Confirm] Message Box

Specify starting options.

Specify the C Source Code Debugger/Win starting options. These options tell the debugger such things as the operating mode and memory configuration. For further details, see Section 3.4 "Specify Starting Options."

Create a shortcut.

Create a shortcut to the current C Source Code Debugger/Win setup by double-clicking the mouse on a group. Double-clicking the mouse on that icon then loads the debugger.

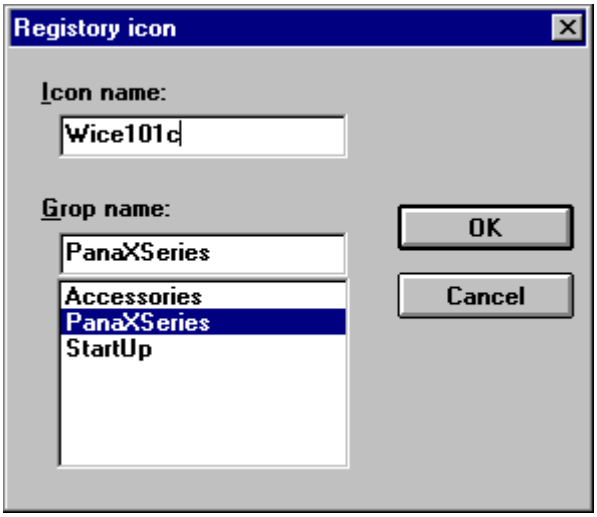


Figure 22. Creating Shortcut Labeled "WICE101C"

Save setup.

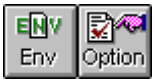
Save the edit setup in the project file. The environment configuration program (the icon labeled "Pset101C") then automatically reads in these settings the next time that you run it. To modify the settings, use the procedures in "Modifying an Existing Environment" below.

Modifying an Existing Environment

Open existing setup.

Open the setup previously saved with the <Save setup> button.

Modify environment.



Modify the items accessible via the <Environment settings> button

and <Starting options> button

.

Create a shortcut.

Create a shortcut to the current C Source Code Debugger/Win setup by double-clicking the mouse on a group. Double-clicking the mouse on that icon then loads the debugger.

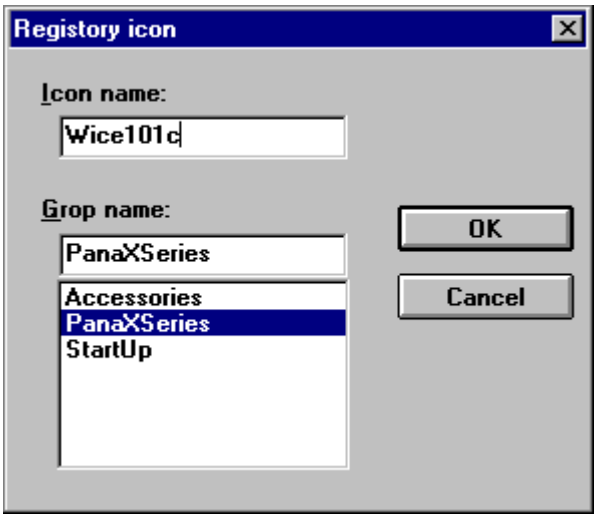


Figure 23. Creating Shortcut Labeled "WICE101C"

Save setup.

Save the edited setup in the project file.

3.2 Check Files

C Source Code Debugger/Win works with the following files.

3.2.1 Files Necessary for Loading

This section lists the files necessary for loading C Source Code Debugger/Win. The debugger reads the first three files from the directory specified with the <NEW> button

.

Environment settings file (PICE101C.ENV)

This file specifies such things as the target board configuration and target resources used by the in-circuit emulator. C Source Code Debugger/Win shares this file with the MS-DOS version of the debugger.

Windows initialization file (WICE101C.INI)

This file contains environment settings for the Windows version: window positions, text fonts, color specifications, tool bar configuration, breakpoints, etc.

Starting options file (WICE101C.INF)

This file contains C Source Code Debugger/Win starting options. It is automatically created with the procedure in Section 3.4 "Specify Starting Options".

Monitor program (MON101C.EX)

This file contains a monitor program that runs on the target CPU. It is identical to the file supplied with the MS-DOS version of the debugger.

Message file (PICE101C.MES)

This resource file contains messages displayed by C Source Code Debugger/Win.

Auto-execute file (INIT.MCR)

C Source Code Debugger/Win automatically executes the contents of this macro file in the [Command] when it loads. In other words, you can store commands for any necessary preliminary processing here to have them automatically run when the debugger loads.

3.2.2 Files Saved at Exit

C Source Code Debugger/Win saves session information in these files just before it exits. They are located in the directory specified with the <Select working directory> button

.

[Memo] Window contents (MEMO.PT)

This file preserves the contents of the [Memo] window.

[Command History] Window (PT101C.DAT)

This file preserves the contents of the [Command History] window.

3.2.3 Other Files

In addition to the files mentioned above, C Source Code Debugger/Win supplies the following files on the floppy disks.

Model-specific definition file (ENV101C.TXT)

This file configures the environment to match the target probe used. The environment settings file (PICE101C.ENV) is created from this file.

C Source Code Debugger/Win help file (WICE101C.HLP)

Pressing the keyboard Help key or clicking the mouse on the <Help> button in a dialog box displays this help file.

Instruction set help file (NEM101C.HLP)

This file provides help for the MN101C00 series instruction set. Clicking the mouse on the <Instruction set> button in the debugger help displays this file. To return to the debugger help, click the mouse on the <Debugger> button.

3.3 Create Environment Settings File

Create the environment settings file (PICE101C.ENV) in the working directory by editing the model-specific definition file (ENV101C.TXT) matching the target probe used. Clicking the mouse on the <Env> button

on the Pset101C tool bar produces the following dialog box. The Table below lists the settings provided.

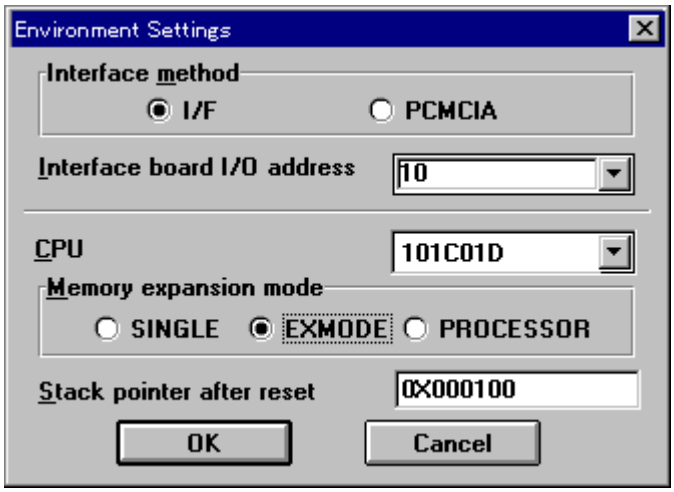


Figure 24. [Environment Settings] Dialog Box

Items	Description
Interface method	Choose either dedicated interface board in the desktop computer or PCMCIA card.
Interface board I/O address	Enter the I/O address specified with the DIP switches on the interface board. [☞"8.2 Configuring Interface Board"]
CPU	Select the device being used.
Memory expansion mode	Select the memory mode.
Stack pointer after reset	Enter an initial value for the stack pointer. (This address must be within memory physically present.)

C Source Code Debugger/Win reads the environment settings file when it loads. Be careful not to accidentally delete or modify the contents.

3.4 Specify Starting Options

3.4.1 Specifying Starting Options via Dialog Box

Clicking the mouse on the <Option> button

on the Pset101C tool bar produces the following dialog box for specifying the C Source Code Debugger/Win starting options. Pset101C writes these settings to the starting options file (WICE101C.INF), which the debugger then reads in when loading. The Table below lists the settings provided.

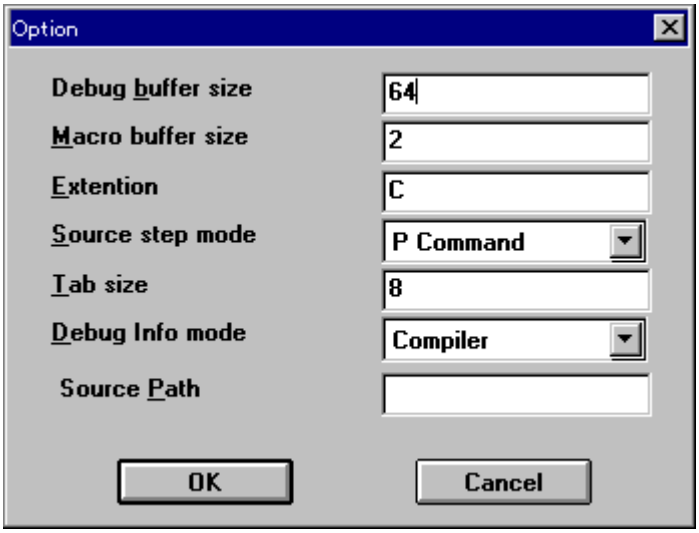


Figure 25. [Option] Dialog Box

Items	Option	Description
Debug buffer size	-B{nnn}	Specifies size of buffer for debugging information (in 16-kilobyte units).
Macro buffer size	-B,{nnn}	Specifies size of buffer for macro definitions (in 1-kilobyte units)
Extension	-E{ext}	Adds an extension to the list of source file types displayed in [Code] windows.
Source step mode	-SP	Specifies use of software breakpoints for source single-step execution.
	-ST	Specifies use of assembler steps for source single-step execution.
Tab size	-TAB{n}	Specifies the tab size for displaying source code in [Code] windows.
Debug info mode	-X	Specifies the assembler debug mode.
	-XC	Specifies the CC101C compiler debug mode.
Source Path	-SD	Specifies the directories containing the source files displayed in [Code] windows.

3.4.2 Specifying Starting Options via Command Line

C Source Code Debugger/Win starting options are normally specified via the Pset101C [Options] dialog box. The specified starting options are then automatically added to the command line generated by clicking on the shortcut. You can, however, also modify these without using Pset101C. For Windows 95, right-click the mouse on the icon, select Properties, and edit the [Target] text box. For Windows V3.1, use Program Manager's [Icon]-[Properties...] command and edit the [Command line] text box on the [Program Item Properties] dialog box.

C Source Code Debugger/Win supports the following starting options.

-B option

This option specifies the sizes of the two buffers for debugging information and for macro definitions. The debugging information area holds a wealth of information: global symbols, local symbols, line numbers, and type information for functions and variables, for example.

-B[<size D>][,<size M>]

<size D> Size of the debugging information area (in 16-kilobyte units). The default is 512 kilobytes.

<size M> Size of macro definition area (in 1-kilobyte units). The default is 2 kilobytes.

-D option

This option specifies the current directory for C Source Code Debugger/Win. The specified directory must contain the environment settings file (PICE101C.ENV) , the monitor program (MON101C.EX) , and the Windows initialization file (WICE101C.INI) .

[■☞"3.2.1 Files Necessary for Loading"]

-D<directory>

C Source Code Debugger/Win uses the specified directory as its current directory. If this option is omitted, the debugger first looks for a directory specified via the [Execution directory] text box on the [Program Item Properties] dialog box and, if that is empty, obtains the directory containing the program file from the [Command line] text box.

-E option

This option adds an extension to the list of source file types displayed in [Code] windows.

-E <extension>

The specified extension becomes the default for displaying source files. Do not include the period. If this option is omitted, the default list consists of the extensions .C and .ASM.

-S options

These options specify the source single-step execution mode.

-SP

This option specifies the use of software breakpoints for source single-step execution. (It is the default.)

-ST

This option specifies the use of assembler steps for source single-step execution. If the default (-SP) fails to produces correct single-step execution, use the -ST option. Note that the -ST option slows down execution speed.

-SD option

This option specifies the directories containing the source files displayed in [Code] windows. You can specify more than one directory by delimitting the directories with semicolons (;).

-SD<directory>

The specified directory becomes the directory with the source files.

For example, enter the following in the icon’s [command line] text box when the source files exist in the directory, C:¥PANAX¥PRJ.

```
C:¥WICE101C¥BIN¥WICE101C.EXE –SDC :¥WICE101C¥PRJ
```

-TAB option

This option specifies the tab size for displaying source code in [Code] windows. Use it to change the tab size to that used in your editor.

-TAB<tab size>

This option sets the tab size to the specified number. If the option is omitted, the default is eight.

For example, to set tabs every four columns, enter the following in the icon's [Command line] text box.

```
C:¥WICE101C¥BIN¥WICE101C.EXE –TAB4
```

-X options

These options specify either the assembler or the C debug mode. Using the wrong specification interferes with proper debugging or limits access to particular functions.

-X

This option specifies assembler debug mode. (It is the default.)

C Source Code Debugger/Win loaded in this mode does not support such C-related commands as stack backtracing and the display of local variables.

-XC

This option specifies CC101C compiler debug mode.

3.5 Load the Debugger

To load C Source Code Debugger/Win, double-click the mouse on the shortcut created with Pset101C.

3.5.1 Debugger Loads Normally

If all goes well, C Source Code Debugger/Win starts by displaying a screen similar to the following.

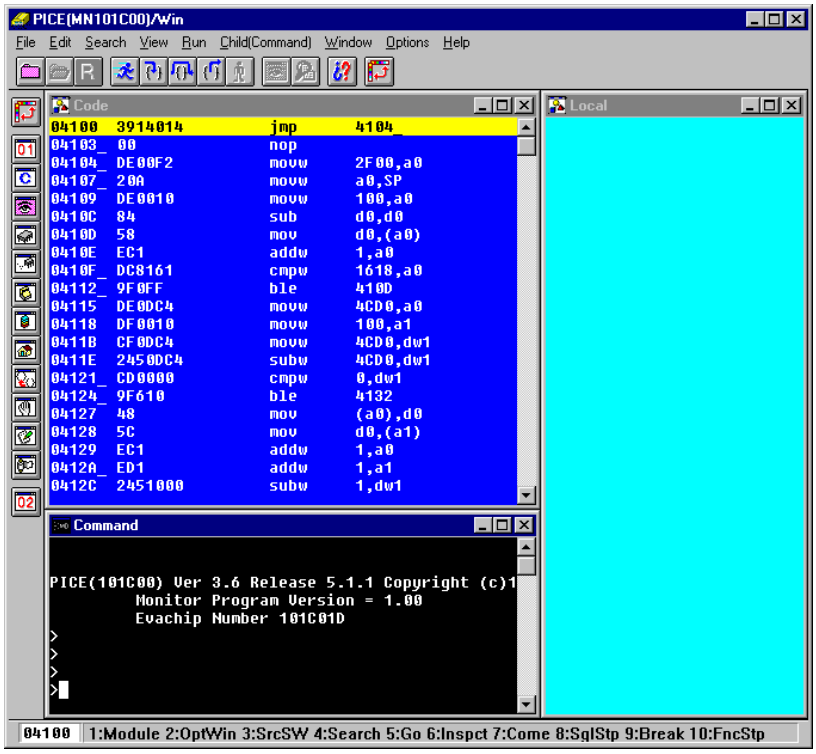

PICE(MN101C00)/Win
File Edit Search View Run Child(Command) Window Options Help
Code
04100 3914014 jmp 4104_
04103_ 00 nop
04104_ DE00F2 movw 2F00,a0
04107_ 20A movw a0,SP
04109 DE0010 movw 100,a0
410C 84 sub d0,d0
410D 58 mov d0,(a0)
410E EC1 addw 1,a0
410F_ DC8161 cmpw 1618,a0
04112_ 9F0FF ble 410D
04115 DE0DC4 movw 4CD0,a0
04118 DF0010 movw 100,a1
411B CF0DC4 movw 4CD0,dw1
411E 2450DC4 subw 4CD0,dw1
04121_ CD0000 cmpw 0,dw1
04124_ 9F610 ble 4132
04127 48 mov (a0),d0
04128 5C mov d0,(a1)
04129 EC1 addw 1,a0
412A_ ED1 addw 1,a1
412C 2451000 subw 1,dw1
Local
Command
PICE(101C00) Ver 3.6 Release 5.1.1 Copyright (c)1
Monitor Program Version = 1.00
Evachip Number 101C01D
04100 1:Module 2:OptWin 3:SrcSW 4:Search 5:Go 6:Inspct 7:Come 8:SglStp 9:Break 10:FncStp

Figure 26. C Source Code Debugger/Win Starting Screen

3.5.2 Debugger Does Not Load

If C Source Code Debugger/Win fails to load, however, see Section 8.3 "Error Messages" for help interpreting the message box that appears.

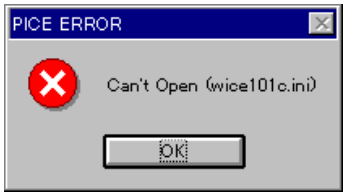


Figure 27.

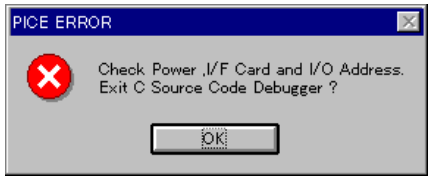


Figure 30.

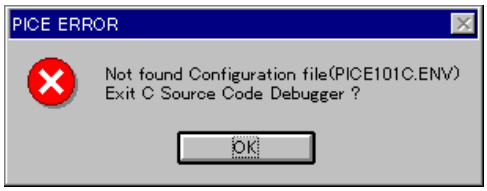


Figure 28.

Figure 31.

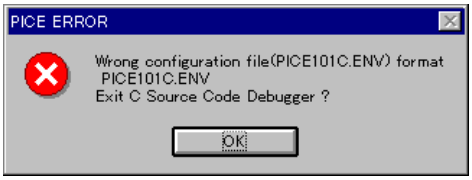


Figure 29.

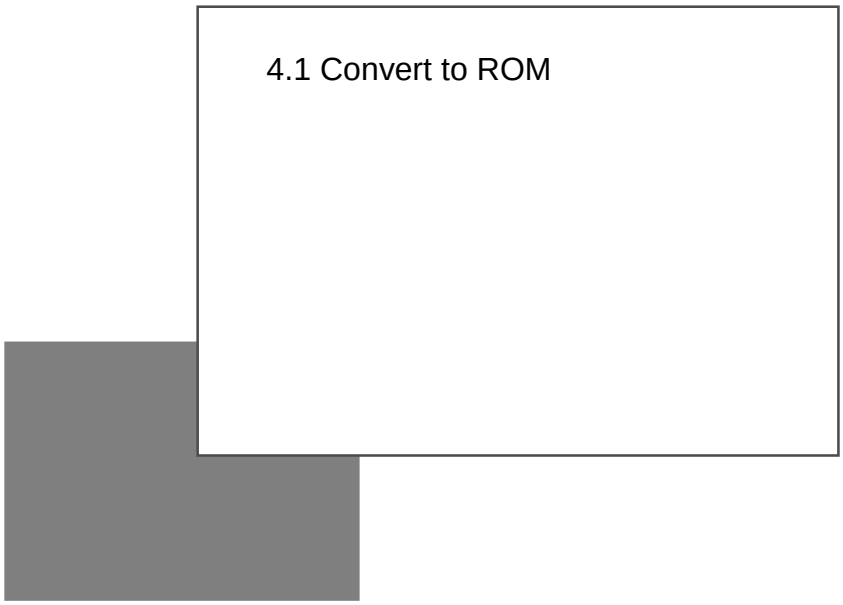
The messages in Figure 27 through Figure 31 indicate that C Source Code Debugger/Win is unable to read the files necessary for loading. Either copy the necessary files into the working directory or rerun the environment configuration program (Pset101C).

[■☞"3.1.1 Load Pset101C", "3.2.1 Files Necessary for Loading"]

Figure 29, for example, reports a problem with the environment settings file (PICE101C.ENV) . Use Pset101C to edit the model-specific definition file and recreate the file.

[■☞"3.3 Create Environment Settings File"]

Chapter 4.Creating User Program to Debug



4.1 Convert to ROM

C Source Code Debugger/Win supports debugging of programs developed in the C programming language at the source level. This Chapter outlines the procedure for using the MN101C00 series C compiler (CC101C) to convert the source files for a user program into an executable file for loading into C Source Code Debugger/Win.

The compiler produces output designed to run on the target system (that is, may be converted to ROM). You must therefore specify the ROM and RAM assignments, stack size, and other parameters to match the target. To modify the setup, rewrite the start-up routine, link file, and other components following the specifications given in the compiler manual.

The following describes the procedure for using the MN101C00 series C compiler (CC101C) to create an executable file (.ex file). As an example, it uses two C source files sample1.c and sample2.c.

C Source Code Debugger/Win supports all C data constructs: scalars (int, char, etc.), pointers, arrays, structures, and unions. It supports local variables, global variables, and static variables.

Compiling

The first step is to create .rf files from the C source files. Always include the compiler's -g option for including detailed debugging information in the object output. You can also have the CC101C driver call the assembler by simply specifying the driver's -c option.

```
>CC101C -c -g sample1.c
>CC101C -c -g sample2.c
```

Assembling

Use the assembler to convert .asm files to .rf files. If the assembly language file is startup.asm, for example, the following command produces an object file. The -g is the debug option.

```
>AS101C -g startup.asm
```

Linking

The linker links all object files together into a single executable (.ex file). Always include the -g option to retain the debugging information in the output. The -o option specifies a name for the output file. The -T options specify starting addresses for the _TEXT and _DATA sections.

```
>LD101C -g -j -osample.ex -T_TEXT=4100 -T_DATA=100 startup.rf sample1.rf
sample2.rf
```

When linking, always include a start-up routine. Microcomputer programs require a start-up routine that initializes registers and RAM and then calls main(). For further details, see the compiler manual.

Loading executable file

The above procedure produces an executable file (sample.ex). Load this user program into C Source Code Debugger/Win with the load (L) command.

Chapter 5. Window Commands

5.1 Screen Layout
5.2 Menus
5.3 Shortcut Keys
5.4 Mouse Operations
5.5 to 5.17 Window Descriptions
5.18 Tool Bar
5.19 Window Bar
5.20 Status Bar
5.21 Dialog Boxes

5.1 Screen Layout

This section describes the major structural elements making up the C Source Code Debugger/Win screen: menus, tool bar, status bar, and debugging windows.

5.1.1 Structural Elements

The figure shows the various window elements.

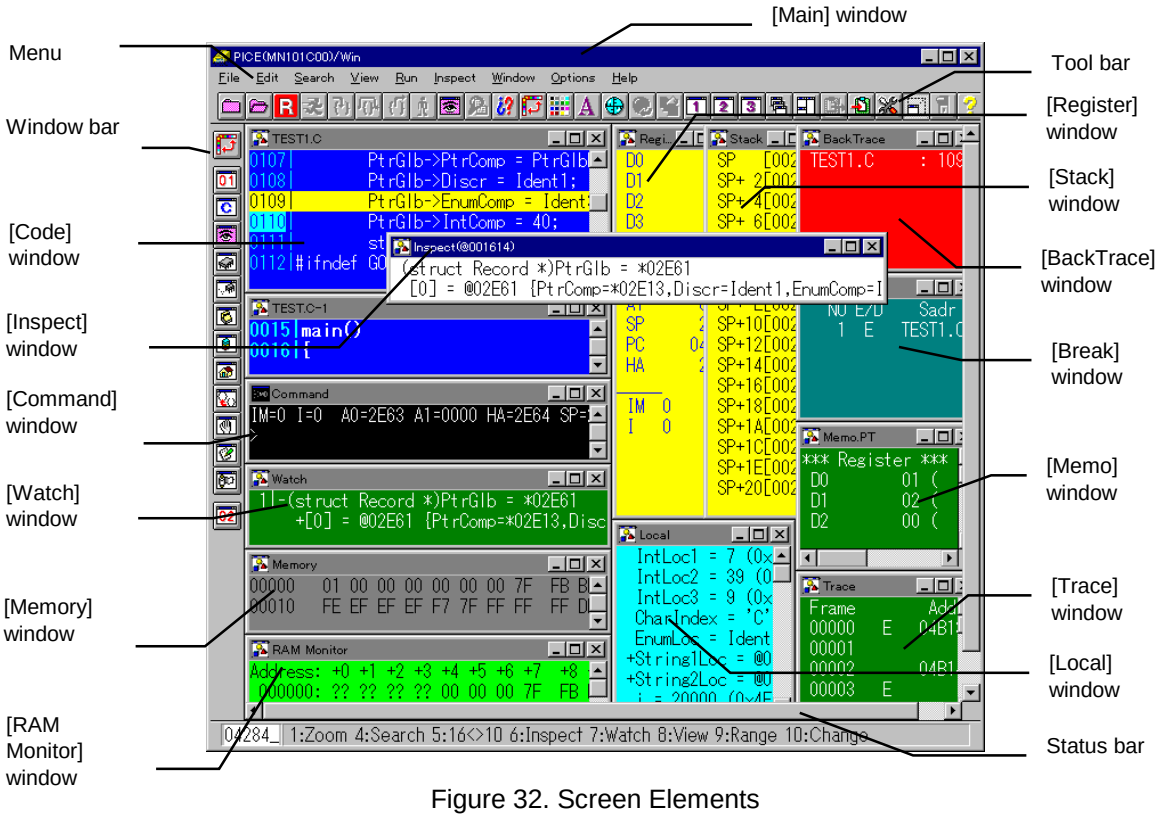


Figure 32. Screen Elements

[Main] Window

This is the C Source Code Debugger/Win main window. It includes such features as the menu bar, tool bar, and status bar.

[Code] Windows

These windows display source code and disassembler output. The program counter (PC) position is indicated in reverse video; software breakpoints, with underlining. There are two such windows available.

[Command] Window

This window is for entering dialog commands and displaying execution results using a traditional TTY interface.

[Memory] Window

This window displays memory contents. It is automatically updated when the CPU stops.

[Register] Window

This window displays the contents of the CPU registers. It is automatically updated when the CPU stops.

[Stack] Window

This window displays the stack contents. It is automatically updated when the CPU stops.

[Local] Window

This window displays the contents of the local variables for the C function that the program counter (PC) is currently accessing. It is automatically updated when the CPU stops.

[Watch] Window

This window displays the contents of watch data. It is automatically updated when the CPU stops.

[BackTrace] Window

This window displays the call history for the current C function. It is automatically updated when the CPU stops.

[Break] Window

This window lists the currently specified breakpoints.

[Memo] Window

This window is a simple editor for taking notes during debugging. C Source Code Debugger/Win automatically saves the contents at exit.

[Inspect] Window

This window displays the contents of variables for inspection.

[Trace] Window

This window displays a dump of real-time trace memory or disassembler output.

[RAM Monitor] Window

This window displays a real-time dump of memory while the user program is executing.

5.1.2 Screen Display

Most windows do not allow horizontal scrolling to display data that spills off the right of the window. To display such data, you must adjust the window size and/or the font size. The only windows supporting horizontal scrolling are the [Code] and the [Memo] windows.

When the results of a [Find] command lie in the hidden part of the window, three right angle brackets (>) appear in the corresponding line. (Figure 33) To display the search results, adjust the window size and/or the font size and issue the [Search]-[Next] command.

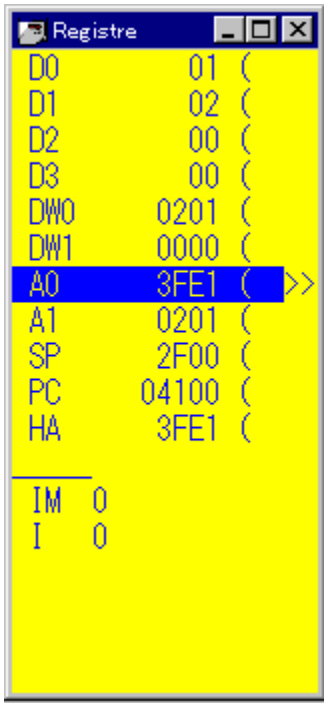
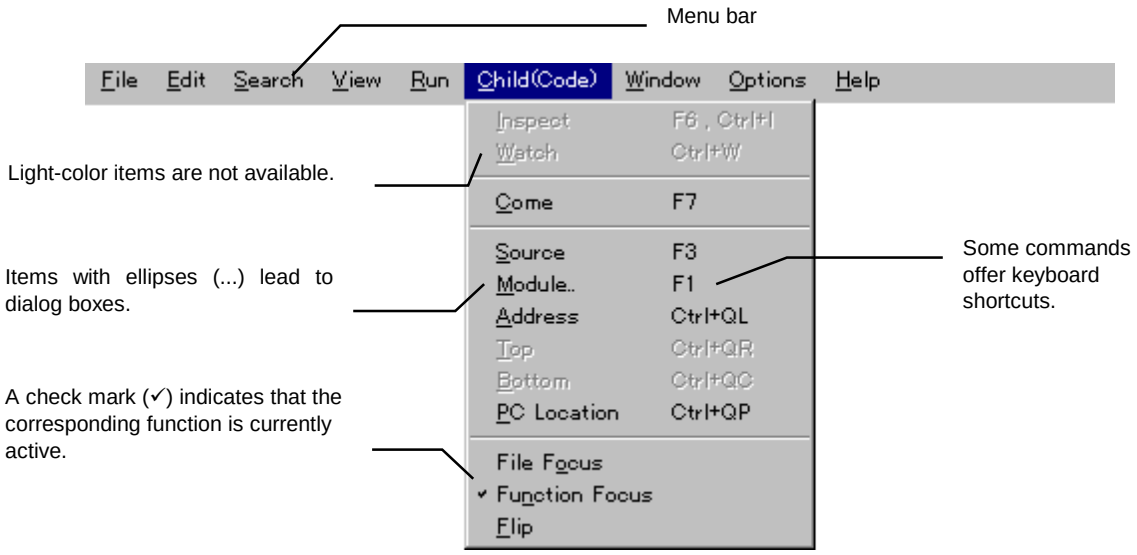


Figure 33. Search Text in Hidden Part of Window

5.2 Menus

The menus contain the C Source Code Debugger/Win commands arranged in groups. Commands either execute immediately or display a dialog box for specifying additional options.

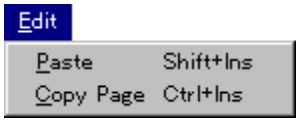


5.2.1 [File] Menu

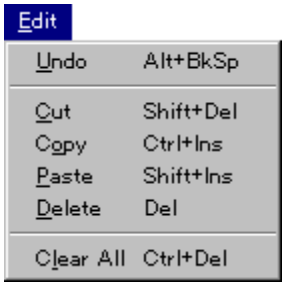
The [File] menu contains commands related to files. The [Module] command is only available when a [Code] window or the [Command] window has the focus.

Menu Item	Function
Load	Displays the dialog box for selecting the user program to load. [■☞"5.21.1 [File Open] Dialog Box"]
Reload	Reloads the program being debugged.
Reset	Resets the evaluation chip.
Module	Displays the dialog box for selecting a source code module for the loaded user program for display in a [Code] window. [■☞"5.21.8 [Module] Dialog Box"]
Exit	Terminates C Source Code Debugger/Win execution.

5.2.2 [Edit] Menu



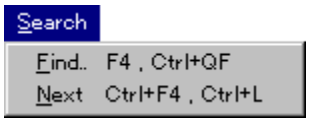
The [Edit] menu contains commands for passing text between windows via the Clipboard.



When the [Memo] window has the focus, the [Edit] menu expands to the menu shown to the left.

Menu Item	Function
Paste	Inserts the Clipboard contents into the current window.
Copy Page	Copies all data from the window to the Clipboard.
Undo	Reverses the results of the last editing command
Cut	Moves the currently selected text to the Clipboard.
Copy	Copies the currently selected text to the Clipboard.
Delete	Deletes the currently selected text.
Clear All	Deletes the entire contents of the [Memo] window.

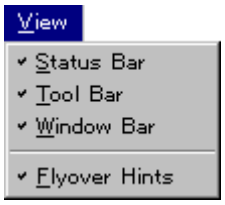
5.2.3 [Search] Menu



The [Search] menu contains commands for searching the current window for a particular text string.

Menu Item	Function
Find	Displays the dialog box for entering the search text and the search direction for the window that currently has the focus. [■☞"5.21.5 [Find String] Dialog Box"]
Next	Searches in the specified direction, starting at the current cursor position in the window that currently has the focus, for the specified text.

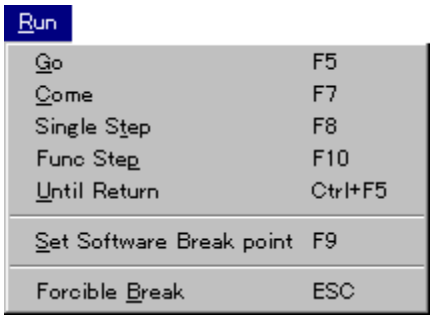
5.2.4 [View] Menu



The [View] menu contains commands controlling the display of the tool bar and other elements.

Menu Item	Function
Status Bar	Alternately displays and hides the status bar. [■☞"5.20 Status Bar"]
Tool Bar	Alternately displays and hides the tool bar. [■☞"5.18 Tool Bar"]
Window Bar	Alternately displays and hides the window bar. [■☞"5.19 Window Bar"]
Flyover Hints	Alternately enables and disables the display of button hints.

5.2.5 [Run] Menu



The [Run] menu contains commands for starting and stopping execution of the user program.

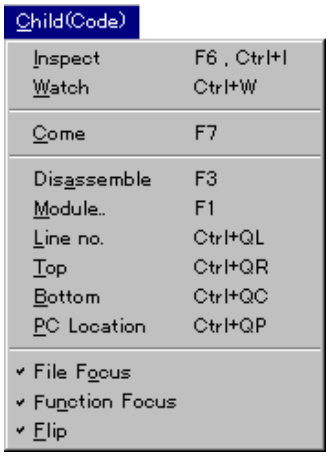
The [Come] and [Set Software Break point] commands are only available when the [Code] window has the focus.

Menu Item	Function
Go	Resumes execution of the user program from the current program counter (PC).
Come	Executes the user program from the current program counter (PC) to the line at the current cursor position.
Single Step	Single-steps execution in units of source lines or machine language instructions.
Function Step	Function-steps in units of source lines or machine language instructions.
Until Return	Executes the user program until the current function returns to its caller.
Set Software Break point	Activates or disables a software breakpoint.
Forcible Break	Forcefully terminates execution of the user program, returning control to C Source Code Debugger/Win. (Interrupts execution of a repeated command or macro.)

5.2.6 Local Menus for Individual Windows

A local menu contains commands available only within the current window. The local menu for the window that currently has the focus appears on the menu bar. Clicking the right mouse button on the display also displays the local menu.

[Child(Code)] Menu



The [Child(Code)] menu contains commands for controling [Code] windows.

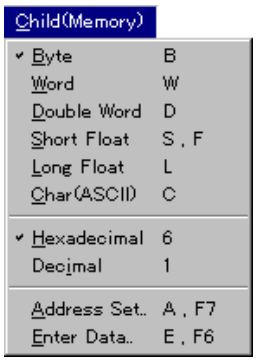
[■☞"5.5.2 [Code] Window Local Menu"]

[Child(Command)] Menu

The [Child(Command)] menu contains commands for controling the [Command] window.

[■☞"5.6.2 [Command] Window Local Menu"]

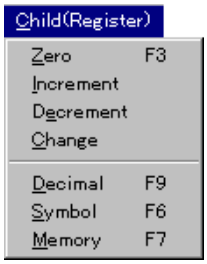
[Child(Memory)] Menu



The [Child(Memory)] menu contains commands for controling the [Memory] window.

[■☞"5.7.2 [Memory] Window Local Menu"]

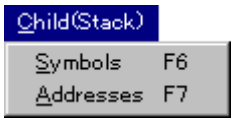
[Child(Register)] Menu



The [Child(Register)] menu contains commands for controling the [Register] window.

[■☞"5.8.2 [Register] Window Local Menu"]

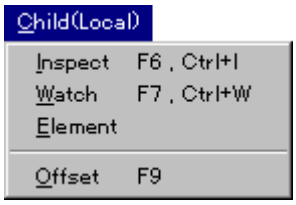
[Child(Stack)] Menu



The [Child(Stack)] menu contains commands for controling the [Stack] window.

[■☞"5.9.2 [Stack] Window Local Menu"]

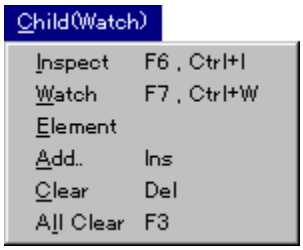
[Child(Local)] Menu



The [Child(Local)] menu contains commands for controling the [Local] window.

[■☞"5.10.2 [Local] Window Local Menu"]

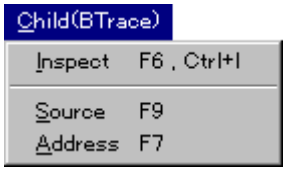
[Child(Watch)] Menu



The [Child(Watch)] menu contains commands for controling the [Watch] window.

[■☞"5.12.2 [Watch] Window Local Menu"]

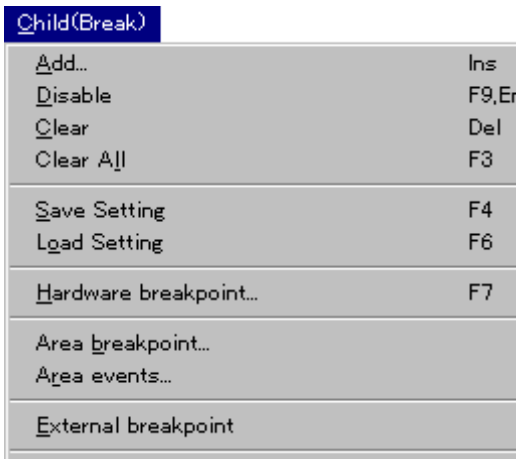
[Child(BTrace)] Menu



The [Child(BTrace)] menu contains commands for controling the [BackTrace] window.

[■☞"5.11.2 [BackTrace] Window Local Menu"]

[Child(Break)] Menu



The [Child(Break)] menu contains commands for controling the [Break] window.

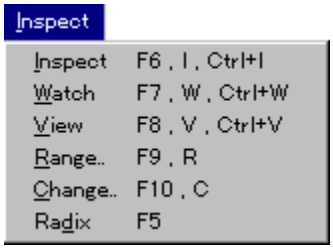
[■☞"5.13.2 [Break] Window Local Menu"]

[Child(Memo)] Menu

The [Child(Memo)] menu contains commands for controling the [Memo] window.

[■☞"5.16.2 [Memo] Window Local Menu"]

[Inspect] Menu



The [Inspect] menu contains commands for controling the [Inspect] window.

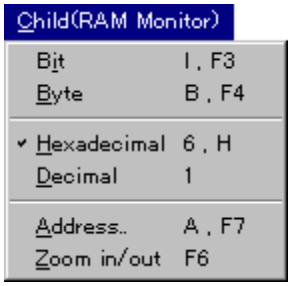
[■☞"5.15.2 [Inspect] Window Local Menu"]

[Child(Trace)] Menu

The [Child(Trace)] menu contains commands for controling the [Trace] window.

[■☞"5.14.2 [Trace] Window Local Menu"]

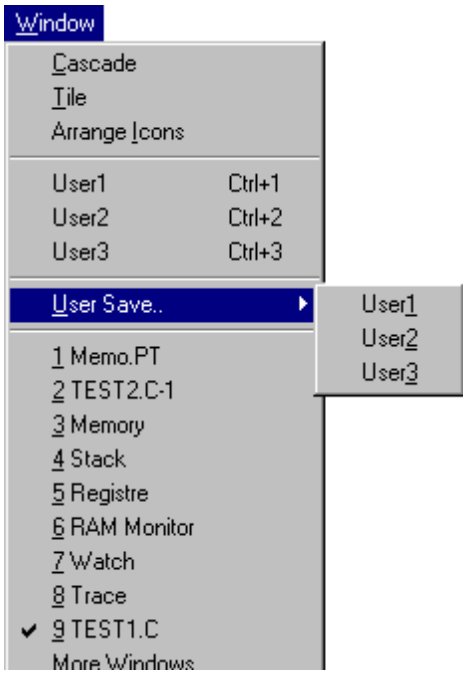
[Child(RAM Monitor)] Menu



The [Child(RAM Monitor)] menu contains commands for controling the [RAM Monitor] window.

[■☞"5.17.2 [RAM Monitor] Window Local Menu"]

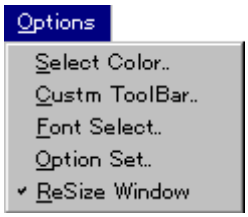
5.2.7 [Window] Menu



The [Window] menu contains commands that operate on windows.

Menu Item	Function
Cascade	Arranges all windows not reduced to icons so that they overlap.
Tile	Arranges all windows not reduced to icons so that they divide up the display area. (C Source Code Debugger/Win picks the positions.)
Arrange Icons	Aligns the windows reduced to icons.
User1	Restores the window layout to that stored with the [User Save]-[User1] command.
User2	Restores the window layout to that stored with the [User Save]-[User2] command.
User3	Restores the window layout to that stored with the [User Save]-[User3] command.
User Save	Saves current window layout.

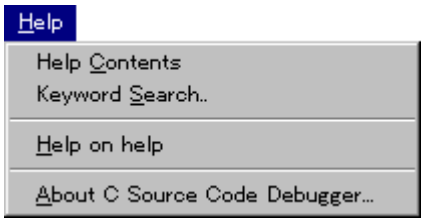
5.2.8 [Options] Menu



The [Options] menu contains commands for configuring C Source Code Debugger/Win.

Menu Item	Function
Select Color	Displays the dialog box for changing the background and text colors for windows. [■☞"5.21.4 [Color] Dialog Box"]
Custm ToolBar	Displays the dialog box for modifying the button layout on the tool bar. [■☞"5.21.3 [Tool Bar] Dialog Box"]
Font Select	Displays the dialog box for changing the font, font style, and font size for text in the window that currently has the focus. [■☞"5.21.2 [Font] Dialog Box"]
Option Set	Displays the dialog box for modifying other C Source Code Debugger/Win settings.
Resize Window	Adjusts the sizes of all child windows to the size of the [Main] window.

5.2.9 [Help] Menu



The [Help] menu contains commands for accessing the help system.

Menu Item	Function
Help Contents	Displays the table of contents for C Source Code Debugger/Win help.
Keyword Search	Searches the C Source Code Debugger/Win on-line help by keyword.
Help on help	Displays a help file for the Windows help system.
About C Source Code Debugger	Displays a brief screen describing C Source Code Debugger/Win.

5.3 Shortcut Keys

Shortcut keys are key combinations defined for the most frequently run C Source Code Debugger/Win commands.

5.3.1 Shortcut Keys Available in All Windows

The following shortcut keys are common to all windows.

Key Combination	Function
F1	Duplicates the action of the <Maximize>/<Restore> button, switching the window that currently has the focus between its maximum and original sizes. Note that the [Code] and [Command] windows use this key for different commands.
F2 CTRL+O	Sends the active window to the rear and makes the next window active.
CTRL+B	Makes the previous window active. (Reverse of F2 and Ctrl+O)
F4 CTRL+Q F	Displays the dialog box for entering the search text and the search direction for the window that currently has the focus. [■☞"5.21.5 [Find String] Dialog Box"]
F5	Runs the user program from the current program counter (PC) position.
F8	Single-steps execution of the user program.
F10	Function-steps through the user program.
CTRL+C Page Down	Scrolls the screen upward by one screen.
CTRL+D →	Moves the cursor one character position to the right.
CTRL+E ↑	Moves the cursor one line upward.
CTRL+L	Searches in the specified direction, starting at the current cursor position in the window that currently has the focus, for the next occurrence of the text specified with F4.
CTRL+R ↑Up	Scrolls the screen downward by one screen.
CTRL+S, ←	Moves the cursor one character position to the left.

CTRL+X ↓	Moves the cursor one line downward.
CTRL+INS	Copies the contents of the window that currently has the focus to the Clipboard.
CTRL+Alt+F1 CTRL+Alt+0	Alternately reduces [Code] window 0 to an icon and restores the window.
CTRL+Alt+F2 CTRL+Alt+C	Alternately reduces the [Command] window to an icon and restores the window.
CTRL+Alt+F3 CTRL+Alt+W	Alternately reduces the [Watch] window to an icon and restores the window.
CTRL+Alt+F4 CTRL+Alt+M	Alternately reduces the [Memory] window to an icon and restores the window.
CTRL+Alt+F5 CTRL+Alt+R	Alternately reduces the [Register] window to an icon and restores the window.
CTRL+Alt+F6 CTRL+Alt+S	Alternately reduces the [Stack] window to an icon and restores the window.
CTRL+Alt+F7 CTRL+Alt+L	Alternately reduces the [Local] window to an icon and restores the window.
CTRL+Alt+F8 CTRL+Alt+T	Alternately reduces the [BackTrace] window to an icon and restores the window.
CTRL+Alt+F9 CTRL+Alt+B	Alternately reduces the [Break] window to an icon and restores the window.
CTRL+Alt+F10 CTRL+Alt+E	Alternately reduces the [Memo] window to an icon and restores the window.
CTRL+1	Restores the screen to user layout 1.
CTRL+2	Restores the screen to user layout 2.
CTRL+3	Restores the screen to user layout 3.
Alt+F10	Displays the local menu for the window that currently has the focus.

5.3.2 Window-Specific Shortcut Keys

In addition to the shortcut keys available in all windows listed in **Section 5.3.1**, there are shortcut keys defined for particular windows. The following pages list these window-specific shortcut keys.

Window	Related Section	Page
[Code] window	5.5.1 [Code] Window Shortcut Keys	77
[Command] window	5.6.1 [Command] Window Shortcut Keys	81
[Memory] window	5.7.1 [Memory] Window Shortcut Keys	84
[Register] window	5.8.1 [Register] Window Shortcut Keys	86
[Stack] window	5.9.1 [Stack] Window Shortcut Keys	88
[Local] window	5.10.1 [Local] Window Shortcut Keys	89
[BackTrace] window	5.11.1 [BackTrace] Window Shortcut Keys	91
[Watch] window	5.12.1 [Watch] Window Shortcut Keys	93
[Break] window	5.13.1 [Break] Window Shortcut Keys	95
[Trace] window	5.14.1 [Trace] Window Shortcut Keys	98
[Inspect] window	5.15.1 [Inspect] Window Shortcut Keys	100
[Memo] window	5.16.1 [Memo] Window Shortcut Keys	102
[RAM Monitor] window	5.17.1 [RAM Monitor] Window Shortcut Keys	104

5.4 Mouse Operations

Mouse operations inside window consist of operations common to all windows and operations available only in particular windows.

5.4.1 Mouse Operations Available in All Windows

This section describes mouse operations available in all windows.

Right button click

Clicking the right mouse button anywhere in the window that currently has the focus displays the local menu for that window. A command may then be selected.

[■☞"5.2.6 Local Menus for Individual Windows"]

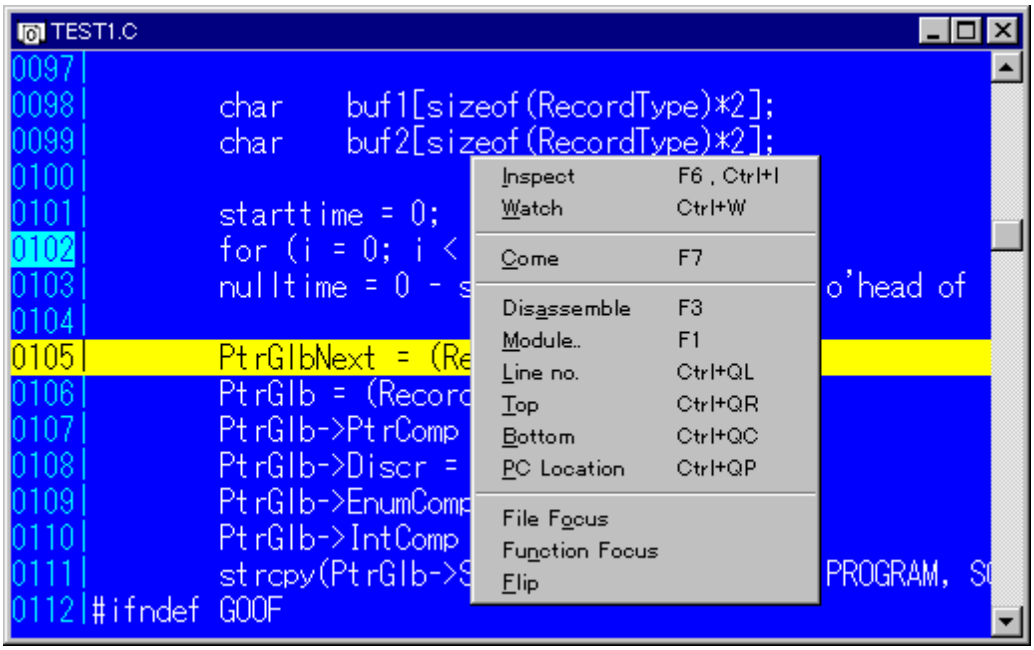


Figure 34. [Code] Window Local Menu

Left button drag

Holding down the left mouse button and dragging the mouse across the text defines an area that appears in reverse. Releasing the left button copies the currently selected area to the Clipboard.

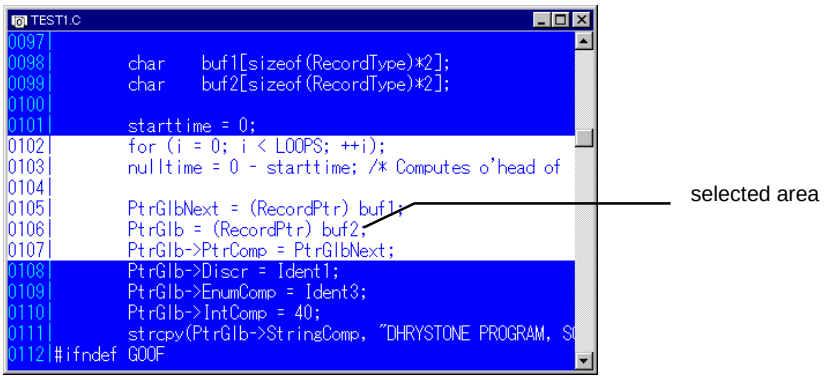


Figure 35. Selecting a Region to Copy

Dragging means moving the mouse with a button pressed.

5.4.2 Window-Specific Mouse Operations

In addition to the mouse operations available in all windows listed in **Section 5.4.1**, there are mouse operations available only in particular windows. The following pages list these window-specific mouse operations.

Window	Related Section	Page
[Code] window	5.5.3 [Code] Window Mouse Operations	80
[Memory] window	5.7.3 [Memory] Window Mouse Operations	85
[Register] window	5.8.3 [Register] Window Mouse Operations	87
[Local] window	5.10.3 [Local] Window Mouse Operations	90
[BackTrace] window	5.11.3 [BackTrace] Window Mouse Operations	92
[Watch] window	5.12.3 [Watch] Window Mouse Operations	94
[Break] window	5.13.3 [Break] Window Mouse Operations	97
[Inspect] window	5.15.3 [Inspect] Window Mouse Operations	101

5.5 [Code] Window

A [Code] window displays the source code either alone or mixed with assembler. There are two [Code] windows. They support a variety of display configurations.

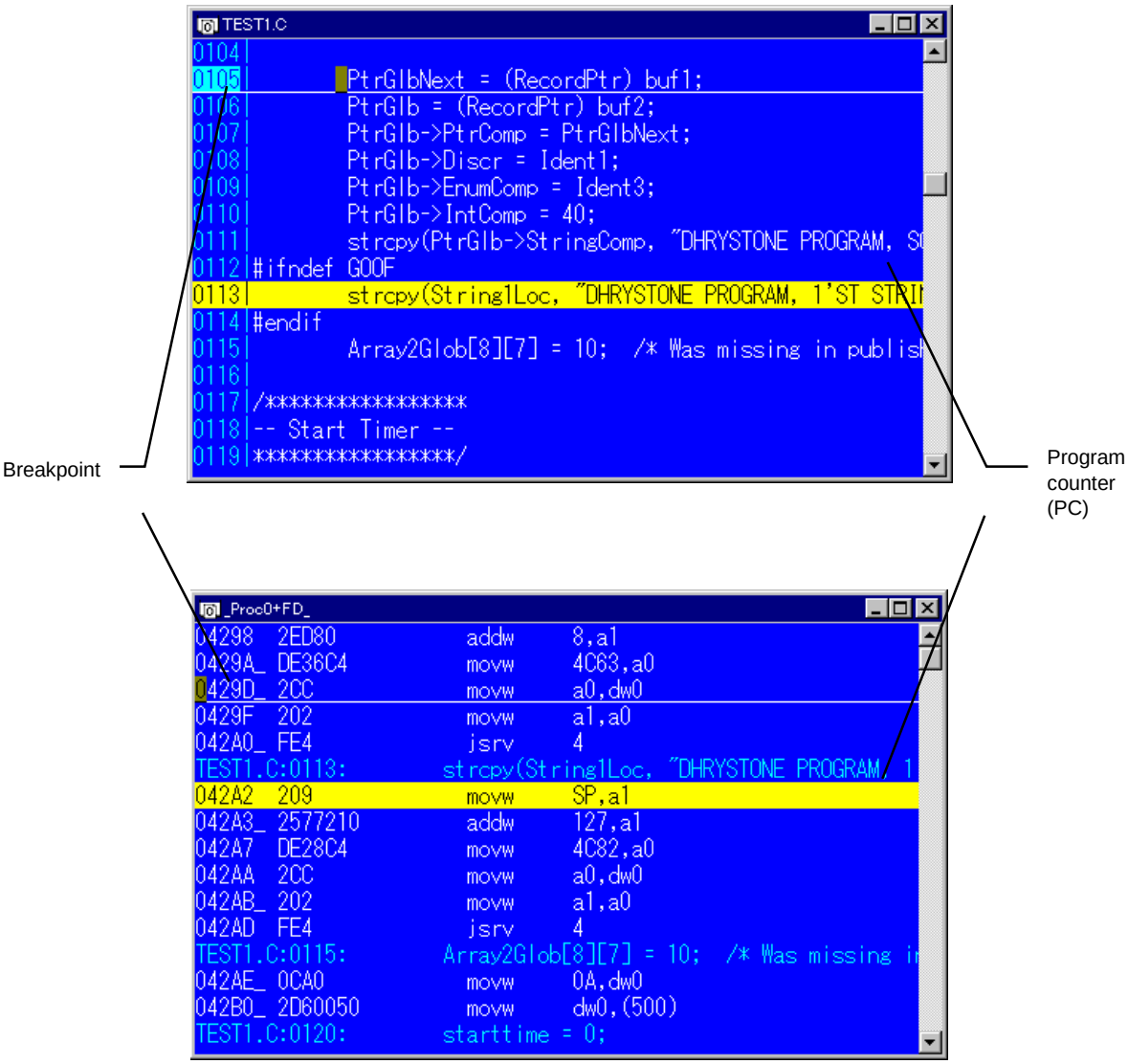


Figure 36. [Code] Window

5.5.1 [Code] Window Shortcut Keys

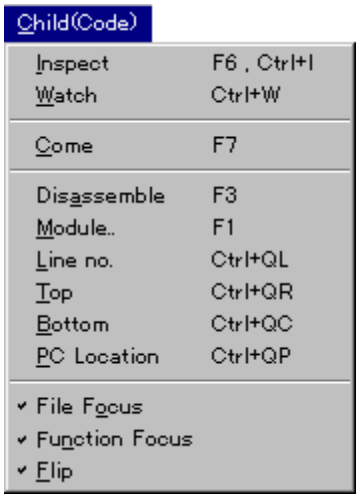
The [Code] windows provide the following shortcut keys for executing commands. These shortcut keys apply when a [Code] window has the focus.

Key Combination	Function	Dialog command
F1	Displays the dialog box for selecting a source code module for the loaded user program for display in a [Code] window. [■☞ "5.21.8 [Module] Dialog Box"]	
F3	Toggles the [Code] window display between source code and disassembler output. The display is always centered on the line currently containing the program counter (PC).	V command, U command
F6 CTRL+F6 CTRL+I	Inspects the currently selected variable.	INS command
F7	Runs the user program from the current program counter (PC) to the current cursor position.	
F9	Creates/removes a software breakpoint at the current cursor position.	BP command
CTRL+F1	Duplicates the action of the <Maximize>/<Restore> button, switching the [Code] window between its maximum and original sizes.	
CTRL+F2	Shifts the focus to the next window.	
CTRL+F3	Toggles the [Code] window display between source code and disassembler output. The display is always centered on the line currently containing the program counter (PC).	V command, U command
CTRL+F4 CTRL+L	Searches for the previously specified text in the previously specified direction from the current cursor position.	
CTRL+F5	Executes the user program until the current function returns to its caller.	G command
CTRL+F7 CTRL+W	Adds the currently selected variable to the [Watch] window.	W command

CTRL+F8 CTRL+V	Views the currently selected variable in the [Command] window.	VAL command, ? command
CTRL+F9 CTRL+G	Inserts the text at the current cursor position in the [Command] window.	
CTRL+F10	Copies the text at the current cursor position to the Clipboard.	
CTRL+Q L	Displays the dialog box for specifying the line number or address to display.	V command, U command
CTRL+QR	Displays the start of the source code.	
CTRL+QC	Displays the end of the source code.	
CTRL+Q J	Returns windows to the starting layout.	
CTRL+Q P	Displays the line currently containing the program counter (PC).	
CTRL+F	For the source code display, moves the cursor to the next word. For the disassembler output display, moves the cursor in the order address -> code -> mnemonic.	
CTRL+A	For the source code display, moves the cursor to the previous word.	

The [Code] window also supports the shifted key combinations given in Section 5.6.1 "[Command] Window Shortcut Keys."

5.5.2 [Code] Window Local Menu



The [Child(Code)] menu contains commands for controling [Code] windows.

Menu item	Function
Inspect	Displays the currently selected variable in the [Inspect] window. If the text at the current cursor position is not a variable that can be inspected, the [Set Inspect data] dialog box appears instead. [■☞"5.21.6 [Set Inspect data] Dialog Box"]
Watch	Adds the currently selected variable to the [Watch] window. If the text at the current cursor position is not a variable that can be watched, the [Set Watch data] dialog box appears instead. [■☞"5.21.7 [Set Watch data] Dialog Box"]
Come	Runs the user program from the current program counter (PC) to the current cursor position.
Disassemble/ Source	Toggles the window display between source code and disassembler output.
Module	Displays the dialog box for selecting a source code module for the loaded user program for display in a [Code] window. [■☞ "5.21.8 [Module] Dialog Box"]
Line no/ Address	Displays the dialog box for specifying the starting line number (source code) or starting address (disassembler output). [■☞"5.21.9 [Set line no.] Dialog Box","5.21.10 [Addressing (Code/RAM Monitor)] Dialog Box"]
Top	Displays the start of the source code.
Bottom	Displays the end of the source code.
PC Location	Displays the current program counter (PC) position.

File Focus	Checking this item while the file currently containing the program counter (PC) is displayed causes the focus to switch back and forth between the two [Code] windows whenever the program counter (PC) leaves or enters the file.
Function Focus	Checking this item while the function currently containing the program counter (PC) is displayed causes the focus to switch back and forth between the two [Code] windows whenever the program counter (PC) leaves or enters the function.
Flip	Checking this item causes the focus to switch back and forth between the two [Code] windows whenever the program counter (PC) enters or leaves a function.

The file lock, function lock, and flip commands are only available when both [Code] windows are displayed.

5.5.3 [Code] Window Mouse Operations

The [Code] window provides mouse equivalents for the following commonly used commands.

Function	Mouse Operation	Dialog Command
Inspect	Left double-click the mouse on variable	INS command
Software breakpoint	Left click the mouse on line number or address	BP command
Single-step execution	Shift+left click	T command
Function -step execution	Shift+right click	P command
[Run] menu	Ctrl+right click	

5.6 [Command] Window

The [Command] window is for entering dialog commands and displaying execution results using a traditional TTY interface.

For further details on dialog commands entered via the [Command] window, see Chapters 6 and 7 and the on-line help.

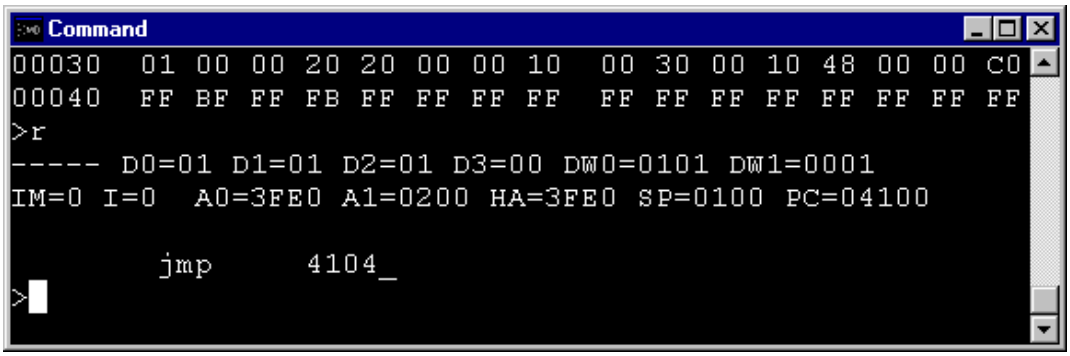


Figure 37. [Command] Window

5.6.1 [Command] Window Shortcut Keys

The [Command] window provides the following shortcut keys for executing commands. These shortcut keys apply when the [Command] window has the focus.

Key Combination	Function
SHIFT+F1	Copies one character from the immediately preceding command. (C1)
SHIFT+F2	Displays the dialog box for selecting from previously entered commands. [■☞"5.21.11 [Command History] Dialog Box"]
SHIFT+F3	Copies all characters beyond the current cursor position from the immediately preceding command. (CA)
SHIFT+F4 CTRL+A	Moves the cursor to the beginning of the command line. (Ln Top)
SHIFT+F5 CTRL+F	Moves the cursor to the end of the command line. (Ln Bot)

SHIFT+F6	Displays a dialog box listing command lines formed by completing the current partial command line with all global symbols starting with the word at the end of the command line. [■☞"5.21.12 [Expand Symbol] Dialog Box"】
SHIFT+F7 CTRL+U	Clears the command line.
SHIFT+F8	Clears the command line and the command history
BS CTRL+H	Deletes the character to the left of the cursor.
← SHIFT+← CTRL+S	Moves the cursor one character to the left.
→ SHIFT+→ CTRL+D	Moves the cursor one character to the right.
DEL CTRL+G	Deletes the character at the current cursor position.
INS CTRL+V	Toggles between the insert and overwrite modes.
SHIFT+↑ CTRL+W	Scrolls backward through the command history starting with the most recent command. If there is text on the command line, only commands beginning with that text are displayed.
SHIFT+↓	Scrolls forward through the command history starting with the oldest command. If there is text on the command line, only commands beginning with that text are displayed.
SHIFT+INS	Inserts the text from the Clipboard on the command line.

The [Command] window supports most of the same function keys and Ctrl+function key combinations as the [Code] window. The only exceptions are the commands related to cursor movement.

[■☞"5.5.1 [Code] Window Shortcut Keys"]

5.6.2 [Command] Window Local Menu

The [Child(Command)] menu contains commands for controling the [Command] window.

Menu Item	Function
Load	Displays the dialog box for selecting the user program to load.
Reload	Reloads the program being debugged.
Reset	Resets the evaluation chip.
Paste	Inserts the Clipboard contents into the current window.
History	Displays the dialog box for selecting from previously entered commands. [■☞"5.21.11 [Command History] Dialog Box"]
Exp. Sym	Displays a dialog box listing command lines formed by completing the current partial command line with all global symbols starting with the word at the end of the command line. [■☞"5.21.12 [Expand Symbol] Dialog Box"]

5.7 [Memory] Window

The [Memory] window displays the contents of memory in various formats.

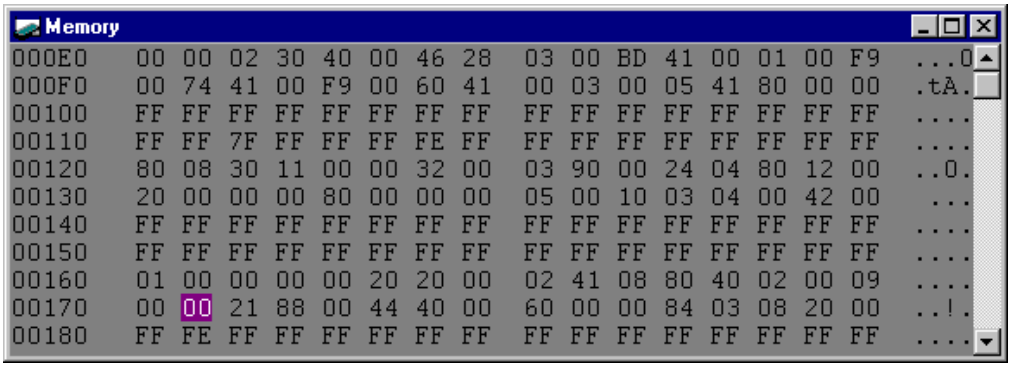


Figure 38. [Memory] Window

5.7.1 [Memory] Window Shortcut Keys

The [Memory] window provides the following shortcut keys for executing commands. These shortcut keys apply when the [Memory] window has the focus.

Key Combination	Function
F7 A	Displays the dialog box for specifying the starting address for the display. [■☞"5.21.13 [Addressing(Memory)] Dialog Box"]
F6 E	Displays the dialog box for modifying data. [■☞"5.21.14 [Set Data] Dialog Box"]
B	Displays the memory data in bytes.
W	Displays the memory data in words.
D	Displays the memory data in double words.
S,F	Displays the memory data in short floats.
L	Displays the memory data in long floats.
C	Displays the memory data in ASCII.
6,H	Displays the memory data in hexadecimal.
1	Displays the memory data in decimal.

5.7.2 [Memory] Window Local Menu

The [Child(Memory)] menu contains commands for controling the [Memory] window.

Menu Item	Function
Byte	Displays the memory data in bytes.
Word	Displays the memory data in words.
Double word	Displays the memory data in double words.
Short Floats	Displays the memory data in short floats.
Long Floats	Displays the memory data in long floats.
Char(ASCII)	Displays the memory data in ASCII.
Hexadecimal	Displays the memory data in hexadecimal.
Decimal	Displays the memory data in decimal.
Address Set	Displays the dialog box for specifying the starting address for the display. [■☞"5.21.13 [Addressing(Memory)] Dialog Box"]
Edit data	Displays the dialog box for modifying data. [■☞"5.21.14 [Set Data] Dialog Box"]

5.7.3 [Memory] Window Mouse Operations

Double-clicking the left mouse button on the data portion of the window displays a dialog box for modifying the data.

[■☞"5.21.14 [Set Data] Dialog Box"]

5.8 [Register] Window

The [Register] window displays the contents of registers and CPU flags. It also displays register-related information.

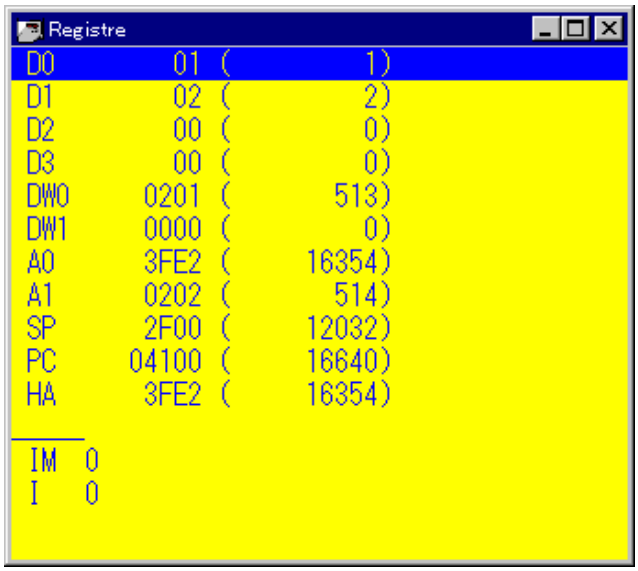


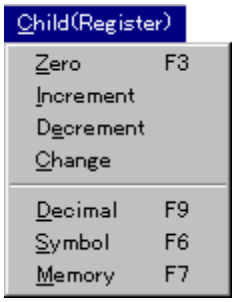
Figure 39. [Register] Window

5.8.1 [Register] Window Shortcut Keys

The [Register] window provides the following shortcut keys for executing commands. These shortcut keys apply when the [Register] window has the focus.

Key Combination	Function
F3	Zeros the register or CPU flag at the current cursor position.
F6	Displays the symbol corresponding to the register value.
F7	Displays the contents of the memory location whose address is in the register.
F9	Displays the register contents in decimal.
↵	Displays the dialog box for modifying the register at the current cursor position or the CPU flags. [■☞"5.21.15 [Register] Dialog Box," "5.21.16 [Flags] Dialog Box"]

5.8.2 [Register] Window Local Menu



The [Child(Register)] menu contains commands for controling the [Register] window.

Menu Item	Function
Zero	Zeros the register at the current cursor position.
Increment	Increments the register at the current cursor position.
Decrement	Decrements the register at the current cursor position.
Change	Displays the dialog box for modifying the register at the current cursor position or CPU flags. [■☞"5.21.15 [Register] Dialog Box," "5.21.16 [Flags] Dialog Box"]
Decimal	Toggles the register display between decimal and hexadecimal formats.
Symbol	Displays the symbol corresponding to the register value.
Memory	Toggles the display of the contents of the memory location whose address is in the register.

5.8.3 [Register] Window Mouse Operations

Double-clicking the left mouse button on a register or CPU flag displays a dialog box for modifying the contents.

[■☞"5.21.15 [Register] Dialog Box," "5.21.16 [Flags] Dialog Box"]

5.9 [Stack] Window

The [Stack] window displays the current stack contents.

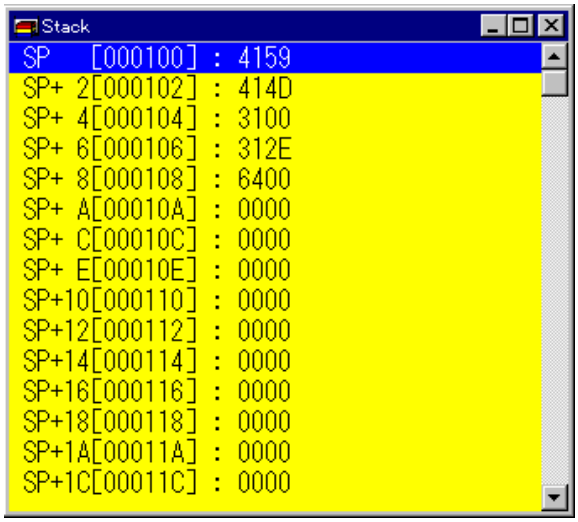


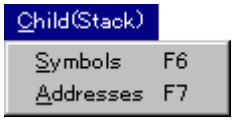
Figure 40. [Stack] Window

5.9.1 [Stack] Window Shortcut Keys

The [Stack] window provides the following shortcut keys for executing commands. These shortcut keys apply when the [Stack] window has the focus.

Key Combination	Function
F6	Displays the symbols corresponding to the stack data.
F7	Displays the actual memory addresses for the stack.

5.9.2 [Stack] Window Local Menu



The [Child(Stack)] menu contains commands for controling the [Stack] window.

Menu Item	Function
Symbols	Displays the symbols corresponding to the stack data.
Addresses	Displays the actual memory addresses for the stack.

5.10 [Local] Window

The [Local] window displays the contents of the local variables for the function currently with the program counter (PC). A plus sign (+) to the left of the variable name indicates a variable with elements (array members, structure members, etc.) that may also be displayed; a minus sign (-), a variable with its elements displayed.

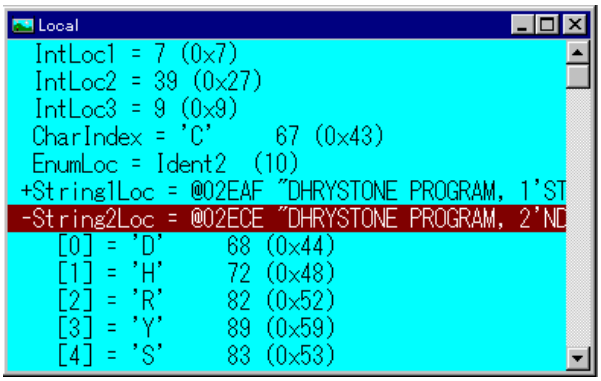

Local
IntLoc1 = 7 (0x7)
IntLoc2 = 39 (0x27)
IntLoc3 = 9 (0x9)
CharIndex = 'C' 67 (0x43)
EnumLoc = Ident2 (10)
+String1Loc = @02EAF "DHRYSTONE PROGRAM, 1'ST
-String2Loc = @02ECE "DHRYSTONE PROGRAM, 2'ND
[0] = 'D' 68 (0x44)
[1] = 'H' 72 (0x48)
[2] = 'R' 82 (0x52)
[3] = 'Y' 89 (0x59)
[4] = 'S' 83 (0x53)

Figure 41. [Local] Window

The [Local] window is only available when C Source Code Debugger/Win is loaded with the -XC option.

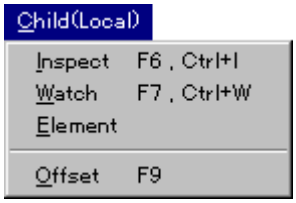
[■☞"3.4 Specify Starting Options"]

5.10.1 [Local] Window Shortcut Keys

The [Local] window provides the following shortcut keys for executing commands. These shortcut keys apply when the [Local] window has the focus.

Key Combination	Function
F6 CTRL+I	Displays the currently selected variable in the [Inspect] window.
F7 CTRL+W	Adds the currently selected variable to the [Watch] window.
F9	Toggles the display of offsets for the local variables on and off.
↵	Toggles the display of elements (array members, structure members, etc.) for the currently selected variable on and off. This command is only available for variables marked with a plus or minus sign.

5.10.2 [Local] Window Local Menu



The [Child(Local)] menu contains commands for controling the [Local] window.

Menu Item	Function
Inspect	Displays the currently selected variable in the [Inspect] window.
Watch	Adds the currently selected variable to the [Watch] window.
Element	Toggles the display of elements (array members, structure members, etc.) for the currently selected variable on and off. This command is only available for variables marked with a plus or minus sign.
Offset	Toggles the display of offsets for the local variables on and off.

5.10.3 [Local] Window Mouse Operations

Double-clicking the left mouse button on a variable marked with a plus or minus sign toggles the display of elements (array members, structure members, etc.) for that variable on and off.

5.11 [BackTrace] Window

The [BackTrace] window traces the call hierarchy from the current function back to main().

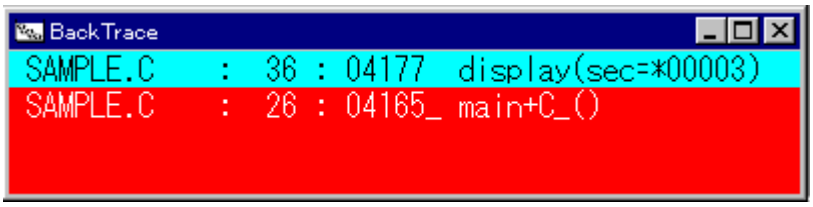


Figure 42. [BackTrace] Window

The [BackTrace] window is only available when C Source Code Debugger/Win is loaded with the -XC option.

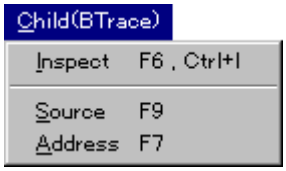
[■☞"3.4 Specify Starting Options"]

5.11.1 [BackTrace] Window Shortcut Keys

The [BackTrace] window provides the following shortcut keys for executing commands. These shortcut keys apply when the [BackTrace] window has the focus.

Key Combination	Function
F6 CTRL+I ↵	Displays, in a [Code] window, the source code for the line at the current cursor position.
F7	Toggles the display of symbols in the window on and off.
F9	Toggles the display of source files and line numbers for symbols in the window on and off.

5.11.2 [BackTrace] Window Local Menu



The [Child(BackTrace)] menu contains commands for controling the [BackTrace] window.

Menu Item	Function
Inspect	Displays, in a [Code] window, the source code for the line at the current cursor position.
Source	Toggles the display of source file names and line numbers for symbols in the window on and off.
Address	Toggles the display of addresses on and off.

5.11.3 [BackTrace] Window Mouse Operations

Double-clicking the left mouse button on the [BackTrace] window displays the source code for that line in a [Code] window.

5.12 [Watch] Window

The [Watch] window displays the contents of specified variables (max. 16).

A plus sign (+) to the left of the variable name indicates a variable with elements (array members, structure members, etc.) that may also be displayed; a minus sign (-), a variable with its elements displayed.

If a watch address is within the sampling area specified with the SM command, the window displays the corresponding variable in real time while the program is executing.

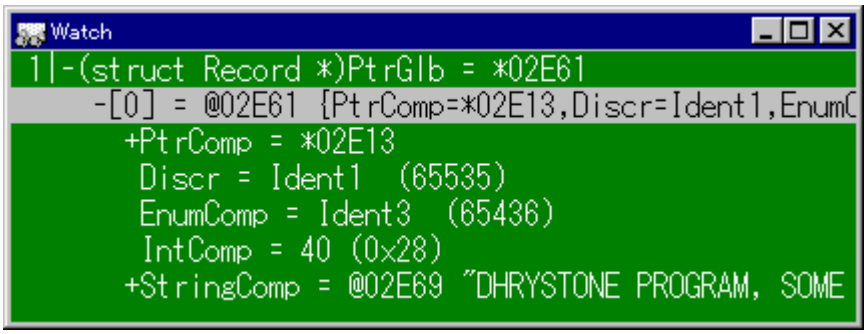


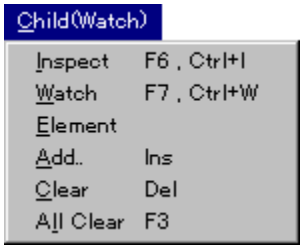
Figure 43. [Watch] Window

5.12.1 [Watch] Window Shortcut Keys

The [Watch] window provides the following shortcut keys for executing commands. These shortcut keys apply when the [Watch] window has the focus.

Key Combination	Function
F3	Clears the [Watch] window of all variables.
F6 CTRL+I	Displays the currently selected variable in the [Inspect] window.
F7 CTRL+W	Adds the currently selected variable to the [Watch] window.
↵	Toggles the display of the variables with elements (the variables with a plus or minus sign on the left of their names) on and off.
INS	Displays the dialog box for adding variables to the [Watch] window.
DEL	Deletes the currently selected variable from the [Watch] window.

5.12.2 [Watch] Window Local Menu



The [Child(Watch)] menu contains commands for controling the [Watch] window.

Menu Item	Function
Inspect	Displays the currently selected variable in the [Inspect] window.
Watch	Adds the currently selected variable to the [Watch] window.
Element	Toggles the display of contents of the local variables with elements (array members, structure members, etc.) on and off.
Add	Displays the dialog box for adding variables to the [Watch] window.
Clear	Deletes the currently selected variable from the [Watch] window.
All Clear	Clears the [Watch] window of all variables.

5.12.3 [Watch] Window Mouse Operations

Double-clicking the left mouse button on a variable marked with a plus or minus sign toggles the display of elements (array members, structure members, etc.) for that variable on and off.

5.13 [Break] Window

The [Break] window displays the currently registered breakpoints (max. 16).

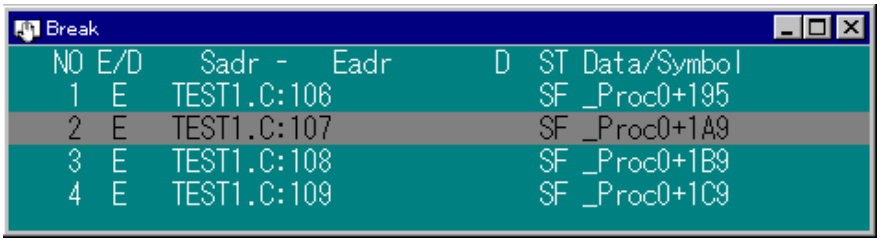

Break
NO E/D Sadr - Eadr D ST Data/Symbol
1 E TEST1.C:106 SF _Proc0+195
2 E TEST1.C:107 SF _Proc0+1A9
3 E TEST1.C:108 SF _Proc0+1B9
4 E TEST1.C:109 SF _Proc0+1C9

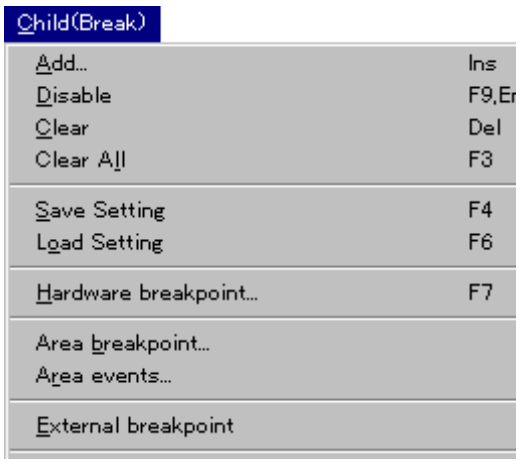
Figure 44. [Break] Window

5.13.1 [Break] Window Shortcut Keys

The [Break] window provides the following shortcut keys for executing commands. These shortcut keys apply when the [Break] window has the focus

Key Combination	Function
F3	Clears all breakpoints.
F4	Saves current breakpoint settings.
F6	Loads the previously saved breakpoint settings.
F7	Displays the dialog box for setting up a hardware breakpoint. [■☞"5.21.18 [Hardware Breakpoint] Dialog Box"]
F9 ↵	Toggles the currently selected breakpoint between enabled and disabled.
INS	Displays the dialog box for setting up a software breakpoint. [■☞"5.21.19 [Set Software Breakpoint] Dialog Box"]
DEL	Clears the currently selected breakpoint.

5.13.2 [Break] Window Local Menu



The [Child(Break)] menu contains commands for controling the [Break] window.

Menu Item	Function
Add	Displays the dialog box for setting up a software breakpoint. [■☞"5.21.19 [Set Software Breakpoint] Dialog Box"]
Disable /Enable	Toggles the currently selected breakpoint between enabled and disabled.
Clear	Clears the currently selected breakpoint.
Clear All	Clears all breakpoints.
Save Setting	Saves current breakpoint settings.
Load Setting	Loads the previously saved breakpoint settings.
Hardware breakpoint	Displays the dialog box for setting up a hardware breakpoint. [■☞"5.21.18 [Hardware Breakpoint] Dialog Box"]
Area breakpoint	Displays the dialog box for setting area event conditions. [■☞"5.21.22 [Area Breakpoint] Dialog Box"]
Area events	Displays the dialog box for managing area events. [■☞"5.21.21 [Area Events] Dialog Box"]
External breakpoint	Sets up an external breakpoint.
Add to AND condition	Adds the currently selected event to the AND condition.
Make sequential breakpoint condition 1	Makes the currently selected event the first condition for a sequential breakpoint.
Makes sequential breakpoint condition 2	Make the currently selected event the second condition for a sequential breakpoint.

5.13.3 [Break] Window Mouse Operations

Double-clicking the left mouse button on a breakpoint toggles it between enabled and disabled.

5.14 [Trace] Window

The [Trace] window displays either a hexadecimal dump of the real-time trace memory or the disassembler output.

Figure 45. [Trace] Window (Disassembler Output)

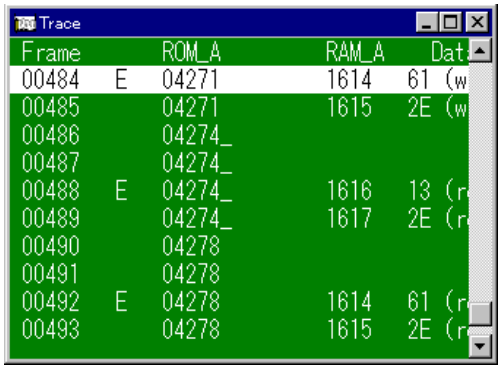


Figure 46. [Trace] Window (Dump Display)

5.14.1 [Trace] Window Shortcut Keys

The [Trace] window provides the following shortcut keys for executing commands. These shortcut keys apply when the [Trace] window has the focus.

Key Combination	Function
F3	Toggles the display format between assembly language and hexadecimal dump.
F6	Displays the dialog box for specifying the starting frame number for the trace buffer display. [■☞"5.21.20 [Jump Frame no.] Dialog Box"]
F7	Toggles the real-time trace function on and off while the user program is executing.
F9	Displays the dialog box for specifying real-time trace events. [■☞"5.21.17 [Event] Dialog Box"]
Ctrl+Q R	Displays the start of the trace window contents.
Ctrl+Q C	Displays the end of the trace window contents.

5.14.2 [Trace] Window Local Menu

The [Child(Trace)] menu contains commands for controling the [Trace] window.

Menu Item	Function
Disassemble/ Dump	Toggles the display format between assembly language and hexadecimal dump.
Jump	Displays the dialog box for specifying the starting frame number for the trace buffer display. [■☞"5.21.20 [Jump Frame no.] Dialog Box"]
Top	Displays the start of the trace window contents.
Bottom	Displays the end of the trace window contents.
Trace Go/ Trace Stop	Toggles the real-time trace function on and off while the user program is executing.
Event	Displays the dialog box for specifying real-time trace events. [■☞"5.21.17 [Event] Dialog Box"]
Area events	Displays the dialog box for managing area events.

5.15 [Inspect] Window

The [Inspect] window displays the specified variables (max. 16) in a format appropriate for the data structure.

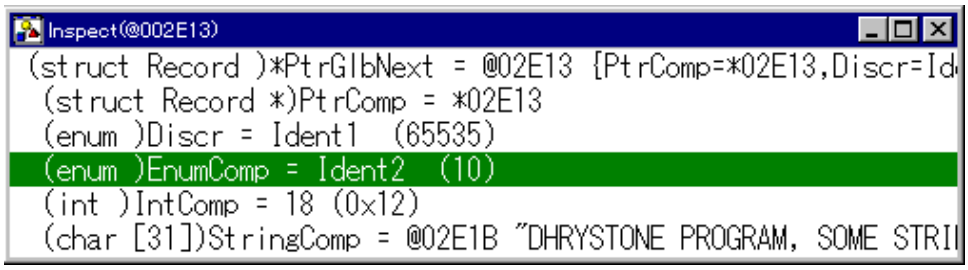

Inspect(@002E13)
(struct Record)*PtrGlbNext = @02E13 {PtrComp=*02E13,Discr=Id
(struct Record *)PtrComp = *02E13
(enum)Discr = Ident1 (65535)
(enum)EnumComp = Ident2 (10)
(int)IntComp = 18 (0x12)
(char [31])StringComp = @02E1B "DHRYSTONE PROGRAM, SOME STRI

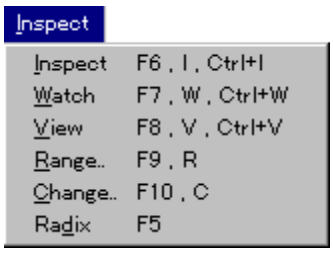
Figure 47. [Inspect] Window

5.15.1 [Inspect] Window Shortcut Keys

The [Inspect] window provides the following shortcut keys for executing commands. These shortcut keys apply when the [Inspect] window has the focus.

Key Combination	Function
F5	Toggles the display format for array variables between decimal and hexadecimal.
F6 I CTRL+I ↵	Displays the currently selected variable in the [Inspect] window.
F7 W CTRL+W	Adds the currently selected variable to the [Watch] window.
F8 V CTRL+V	Displays the currently selected variable in the [Command] window's view format.
F9 R	Displays the dialog box for specifying the display range for the currently selected variable.
F10 C	Displays the dialog box for modifying the contents of the currently selected variable.

5.15.2 [Inspect] Window Local Menu



The [Inspect] menu contains commands for controling the [Inspect] window.

Menu Item	Function
Inspect	Displays the currently selected variable in the [Inspect] window.
Watch	Adds the currently selected variable to the [Watch] window.
View	Displays the currently selected variable in the [Command] window's view format.
Range	Displays the dialog box for specifying the display range for the currently selected variable.
Change	Displays the dialog box for modifying the contents of the currently selected variable.
Radix	Toggles the display format for array variables between decimal and hexadecimal.

5.15.3 [Inspect] Window Mouse Operations

Double-clicking the left mouse button on a variable displays the variable in the [Inspect] window.

5.16 [Memo] Window

The [Memo] window is a simple editor.

This window supports the Clipboard for moving data between windows, so you can, for example, copy the values from the [Register] window here before running the user program, copy them again after a break, and compare the two sets. You can also edit a macro in the [Memo] window and then copy it to the [Command] window.

C Source Code Debugger/Win automatically saves the contents of this window to the file MEMO.PT at exit and reads them back in the next time that it loads.

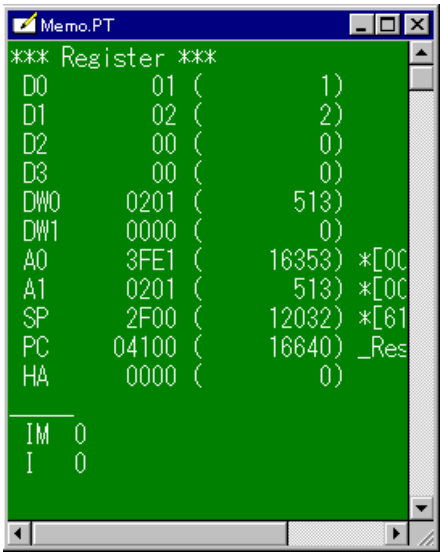


Figure 48. [Memo] Window

5.16.1 [Memo] Window Shortcut Keys

The [Memo] window provides the following shortcut keys for executing commands. These shortcut keys apply when the [Memo] window has the focus.

Key Combination	Function
Ctrl+Ins	Copies the currently selected text to the Clipboard.
Ctrl+Del	Deletes the entire contents of the [Memo] window.
Shift+Ins	Inserts the text from the Clipboard at the current cursor position.
Shift+Del	Copies the currently selected text to the Clipboard and deletes the original.
Alt+BS	Reverses the results of the last editing command.

5.16.2 [Memo] Window Local Menu

The [Child(Memo)] menu contains commands for controling the [Memo] window.

Menu Item	Function
Paste	Inserts the text from the Clipboard at the current cursor position.
Undo	Reverses the results of the last editing command.
Cut	Copies the currently selected text to the Clipboard and deletes the original.
Copy	Copies the currently selected text to the Clipboard.
Delete	Deletes the currently selected text.
Clear All	Deletes the entire contents of the [Memo] window.

5.17 [RAM Monitor] Window

The [RAM Monitor] window displays, in real time and in various formats, the contents of the 64-byte sampling area specified with the SM command while the user program is executing. Data locations outside the sampling area are filled with dashes. Scrolling the window automatically changes the sampling area.

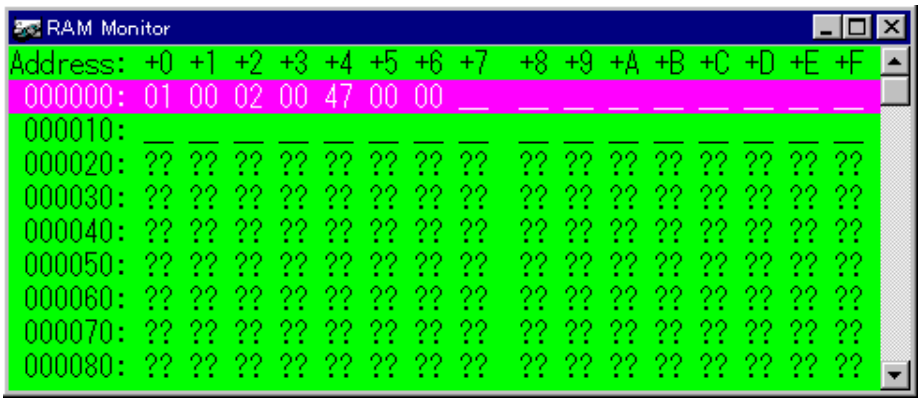


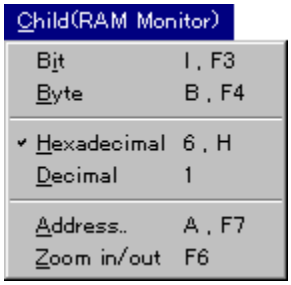
Figure 49. [RAM Monitor] Window

5.17.1 [RAM Monitor] Window Shortcut Keys

The [RAM Monitor] window provides the following shortcut keys for executing commands. These shortcut keys apply when the [RAM Monitor] window has the focus

Key Combination	Function
F7, A	Displays the dialog box for specifying the starting address for the display. [■☞"5.21.13 [Starting Address (Memory)] Dialog Box"]
B	Displays the memory data in bytes.
I	Displays the memory data in bits.
6, H	Displays the memory data in hexadecimal.
1	Displays the memory data in decimal.

5.17.2 [RAM Monitor] Window Local Menu



The [Child(RAM Monitor)] menu contains commands for controling the [RAM Monitor] window.

Menu Item	Function
Bit	Displays the memory data in bits.
Byte	Displays the memory data in bytes.
Hexadecimal	Displays the memory data in hexadecimal.
Decimal	Displays the memory data in decimal.
Address	Displays the dialog box for specifying the starting address for the display. [■☞"5.21.13 [Addressing(Memory)] Dialog Box"]
Zoom in/out	Displays the all memory datas or 32byte datas.

5.18 Tool Bar

This section describes the C Source Code Debugger/Win tool bar.

The tool bar is a handy new feature with buttons that provide instant access, with a single mouse click, to C Source Code Debugger/Win commands.

The following describes the procedure for assigning buttons to the tool bar and the function of each button available. The [View]-[Tool Bar] command alternately hides and displays the tool bar.

[■☞"5.2.4 [View] Menu"]

Figure 50. Sample Tool Bar

5.18.1 Tool Bar Configuration

The [Options]-[Custm ToolBar] command displays the [Tool Bar] dialog box. Select a button from the [List of Button] list box and click the mouse on the <Add> button to add the button to the [Tool Bar] list box.

[■☞"5.21.3 [Tool Bar] Dialog Box"]

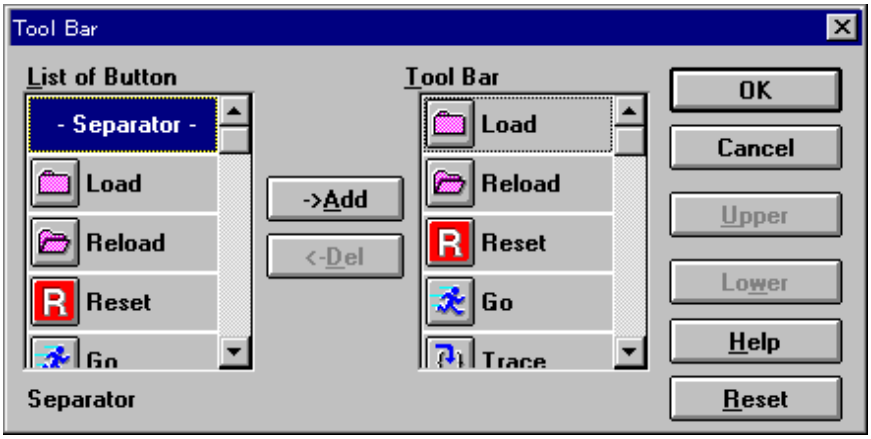


Figure 51. [Tool Bar] Dialog Box

5.18.2 Button Functions

The following is a list of the buttons available for assignment to the tool bar and their functions.

Button	Function
	Loads the user program to be debugged. [■☞"5.21.1 [File Open] Dialog Box"]
	Reloads the currently loaded program.
	Resets the evaluation chip.
	Runs the user program from the current program counter (PC) position.
	Single-steps execution in source line units or machine language instruction units.
	Function-steps execution in source line units or machine language instruction units.
	Executes the user program until the current function returns to its caller.
	Forcefully terminates execution of the user program, returning control to C Source Code Debugger/Win. (Interrupts execution of a repeated command or macro.)
	Adds the currently selected variable to the [Watch] window. If the text at the current cursor position is not a variable that can be watched, the [Add to Watch] dialog box appears instead. [■☞"5.21.7 [Set Watch data] Dialog Box"]
	Displays the currently selected variable in the [Inspect] window. If the text at the current cursor position is not a variable that can be inspected, the [Add to Inspect] dialog box appears instead. [■☞"5.21.6 [Set Inspect data] Dialog Box"]
	Alternately enables and disables the display of button hints that appear on the status line when the mouse cursor passes over buttons.
	Switches the tool bar display position.
	Displays the dialog box for changing the background and text colors for windows. [■☞"5.21.4 [Color] Dialog Box "]
	Displays the dialog box for changing the font, font style, and font size for text in the window that currently has the focus. [■☞"5.21.2 [Font] Dialog Box"]
	Displays the dialog box for entering the search text and the search direction for the window that currently has the focus. [■☞"5.21.5 [Find String] Dialog Box"]
	Searches in the specified direction, starting at the current cursor position in the window that currently has the focus, for the specified text.
	Displays the dialog box for selecting a source code module for the loaded user program for display in a [Code] window. [■☞"5.21.8 [Module] Dialog Box"]

Restores window layout #1.

Restores window layout #2.

Restores window layout #3.

Arranges all windows not reduced to icons so that they overlap.

Arranges all windows not reduced to icons so that they divide up the display area. (C Source Code Debugger/Win picks the positions.)

Inserts the text from the Clipboard at the current cursor position in the window that currently has the focus.

Copies the currently selected text in the window that currently has the focus to the Clipboard.

Displays the dialog box for modifying the button layout on the tool bar.

[■☞"5.21.3 [Tool Bar] Dialog Box"]

Adjusts the sizes of all child windows to the size of the [Main] window.

Toggles the [Code] window display format between assembly language and hexadecimal dump.

Displays C Source Code Debugger/Win help.

Exits C Source Code Debugger/Win.

5.19 Window Bar

This section describes the C Source Code Debugger/Win window bar. The window bar is for rapidly switching between C Source Code Debugger/Win windows. The [View]-[Window Bar] command alternately hides and displays the window bar. The following lists the window for each button. The button settings on the window bar cannot be changed.

[■☞"5.2.4 [View] Menu"]

Figure 52. Window Bar

Button	Window
	[Code] window 0
	[Command] window
	[Watch] window
	[Memory] window
	[Register] window
	[Stack] window
	[Local] window
	[BackTrace] window
	[Break] window
	[Memo] window
	[Trace] window
	[RAM Monitor] window
	[Code] window 1

5.20 Status Bar

The status bar displays the real-time trace address, hints for shortcut keys, buttons, and menu, error messages, C Source Code Debugger/Win status messages, and the like. The [View]-[Status Bar] command alternately hides and displays the status bar.

[■☞"5.2.4 [View] Menu"]

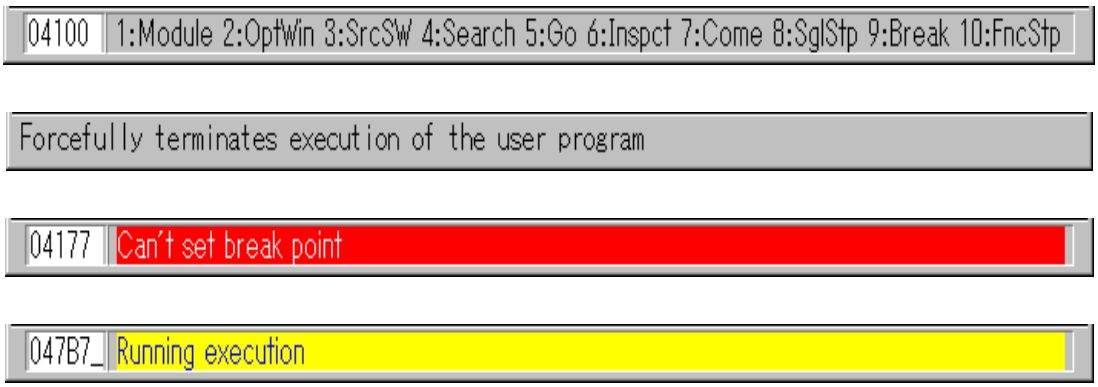

04100 1:Module 2:OptWin 3:SrcSW 4:Search 5:Go 6:Inspct 7:Come 8:SglStp 9:Break 10:FncStp
Forcefully terminates execution of the user program
04177 Can't set break point
047B7_ Running execution

Figure 53. Sample Status Bars

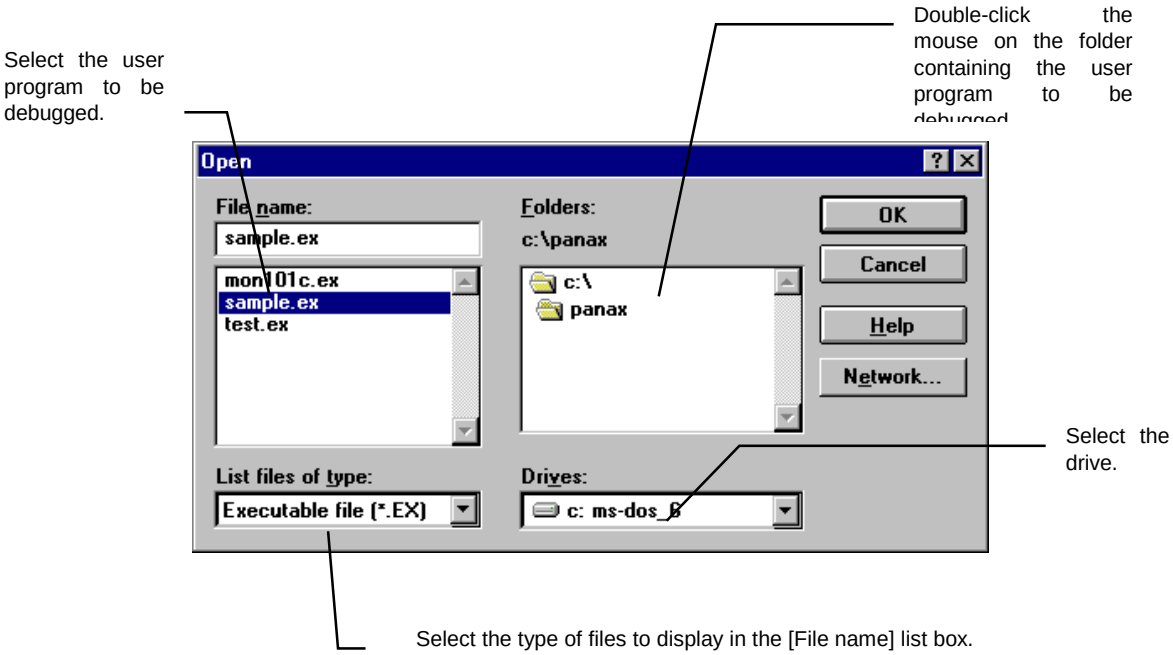
5.21 Dialog Boxes

C Source Code Debugger/Win has many dialog boxes. This section discusses them individually.

5.21.1 [File Open] Dialog Box

[File]-[Load],

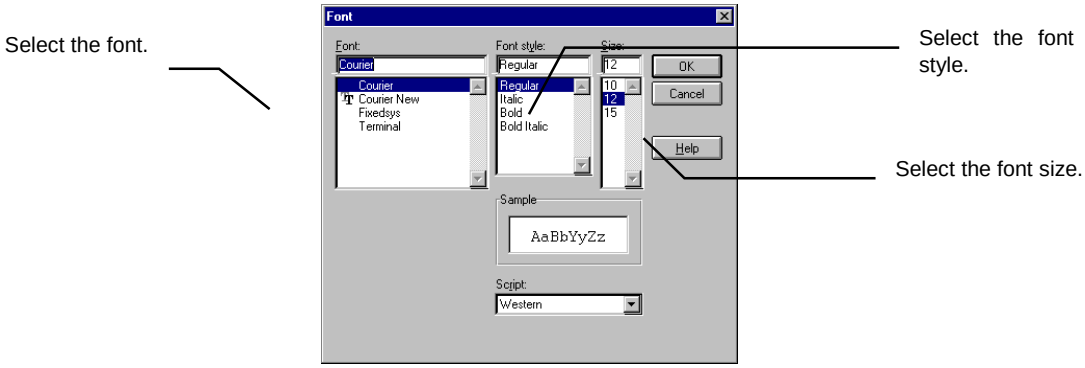
The [File Open] dialog box is for selecting and loading the user program to be debugged.



5.21.2 [Font] Dialog Box

[Options]-[Font],

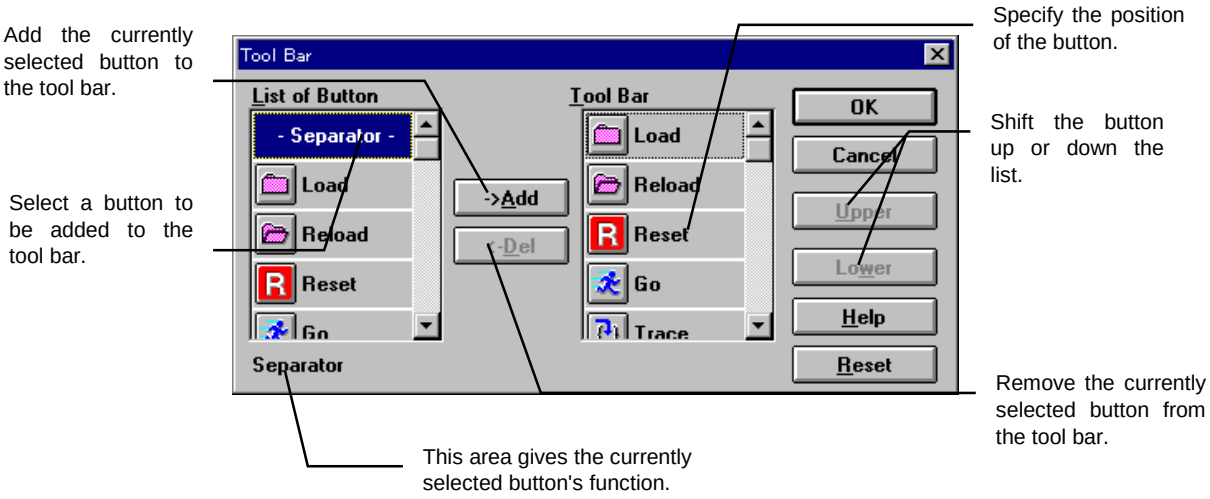
The [Font] dialog box is for changing the font, font style, and font size for text in the window that currently has the focus.



5.21.3 [Tool Bar] Dialog Box

[Options]-[Custm ToolBar],

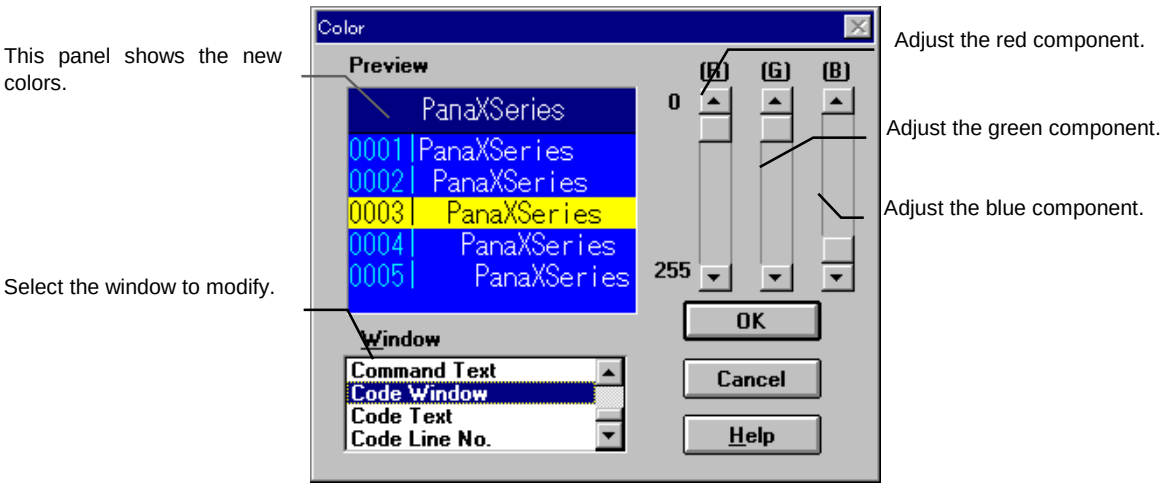
The [Tool Bar] dialog box is for modifying the button layout on the tool bar. Selecting a button in the [Tool Bar] list box and pressing the Del key removes the currently selected button from the tool bar.



5.21.4 [Color] Dialog Box

[Options]-[Select Color],

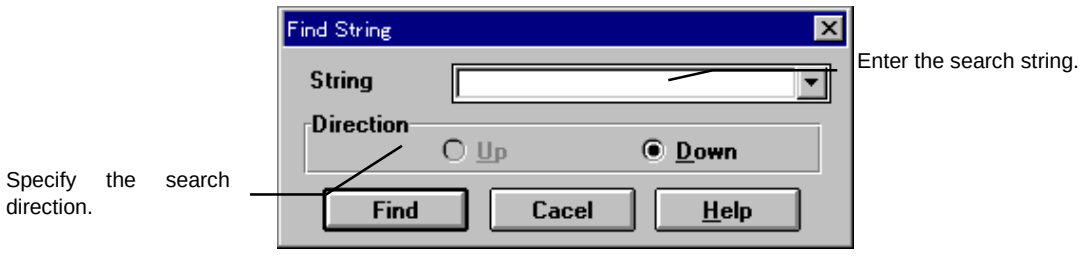
The [Color] dialog box is for changing the background and text colors for windows.



5.21.5 [Find String] Dialog Box

[Search]-[Find],

The [Find String] dialog box is for entering the search text and the search direction for the window that currently has the focus.

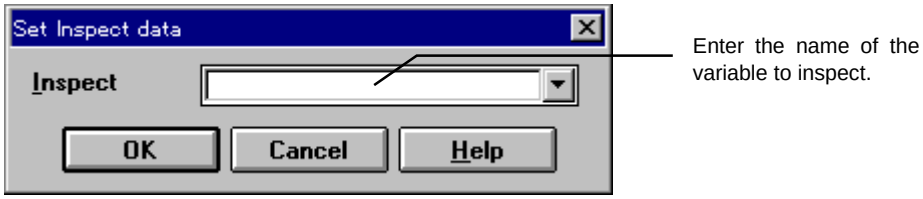


The default search direction is <Upward> for the [Command] window and <Downward> for the others.

5.21.6 [Set Inspect data] Dialog Box

[Child(Code)]/[Child(Local)]/[Child(Watch)]/[Inspect]-[Inspect],

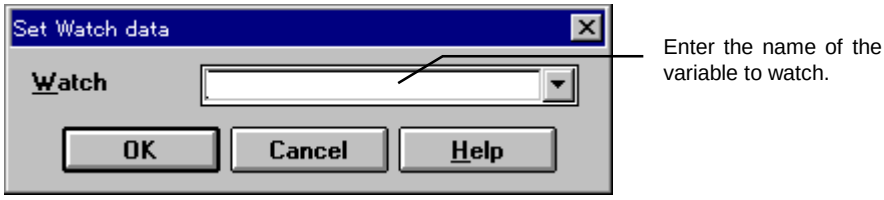
The [Set Inspect data] dialog box is for specifying a variable to inspect.



5.21.7 [Set Watch data] Dialog Box

[Child(Code)]/[Child(Local)]/[Child(Watch)]/[Inspect]-[Watch],

The [Set Watch data] dialog box is for specifying a variable to watch.

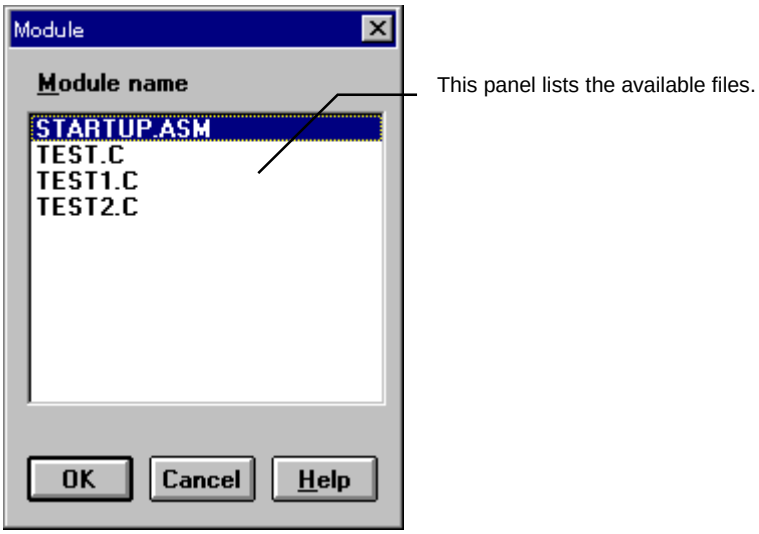


Only C variables may be specified in these dialog boxes. To specify arbitrary locations in memory, use the W command. For further details, see the on-line help.

5.21.8 [Module] Dialog Box

[File]/[Child(Code)]-[Module],

The [Module] dialog box is for selecting a source code module for the loaded user program for display in a [Code] window. The [Module name] list box contains the names of all files specified in the debugging information within the loaded user program plus those added with the V command.



5.21.9 [Set line no.] Dialog Box

[Child(Code)]-[Line no.]

The [Set line no.] dialog box is for specifying the starting line number for the source code in a [Code] window.

5.21.10 [Addressing (Code/RAM Monitor)] Dialog Box

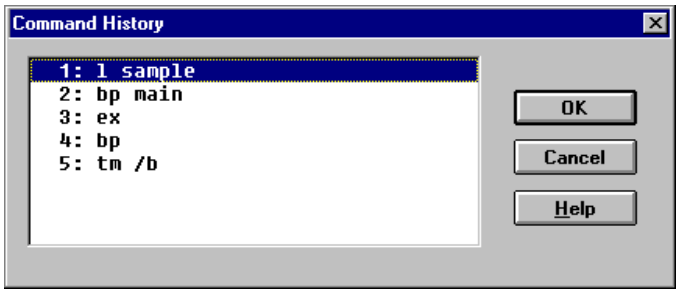
[Child(Code)]/[Child(RAM Monitor)]-[Address]

The [Address (Code/RAM Monitor)] dialog box is for specifying the starting address for the disassembler output in the [Code] window or [RAM Monitor] window.

5.21.11 [Command History] Dialog Box

[Child(Command)]-[History]

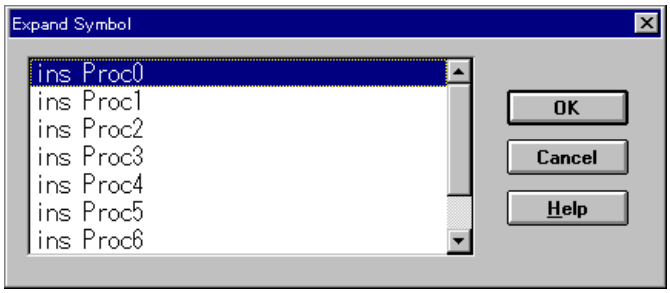
The [Command History] dialog box is for selecting from commands previously entered in the [Command] window. If there is text at the current prompt on the command line, only commands beginning with that text are displayed.



5.21.12 [Expand Symbol] Dialog Box

[Child(Command)]-[Exp. Sym]

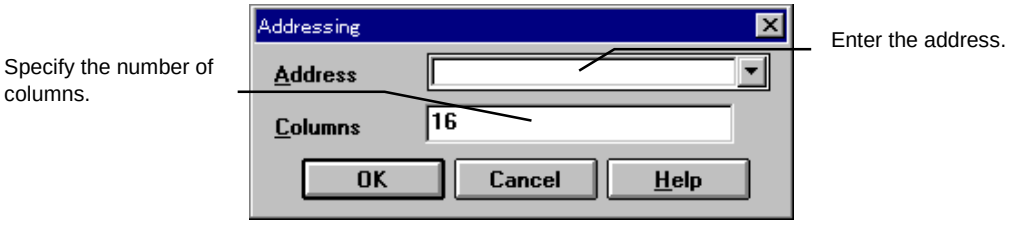
The [Expand Symbol] dialog box displays a list of command lines formed by completing the current partial command line with all global symbols starting with the word at the end of the command line. (The following example is for the partial command line "ins P")



5.21.13 [Addressing(Memory)] Dialog Box

[Child(Memory)]-[Address]

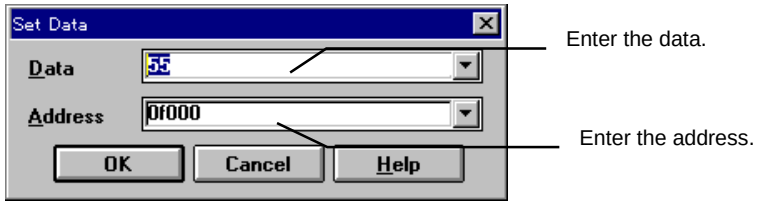
The [Addressing(Memory)] dialog box is for specifying the starting address for the dump list in a [Memory] window.



5.21.14 [Set Data] Dialog Box

[Child(Memory)]-[Enter Data]

The [Set Data] dialog box is for modifying the contents of memory.



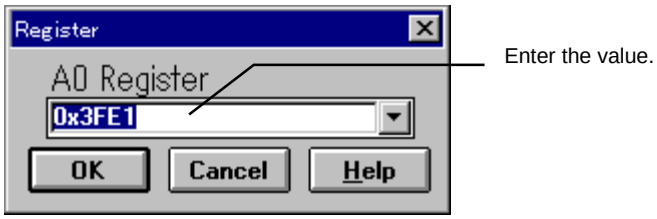
Clicking the mouse on the <OK> button modifies the data and advances to the next address.

To close this dialog box, click the mouse on the <Cancel> button.

5.21.15 [Register] Dialog Box

[Child(Register)]-[Change]

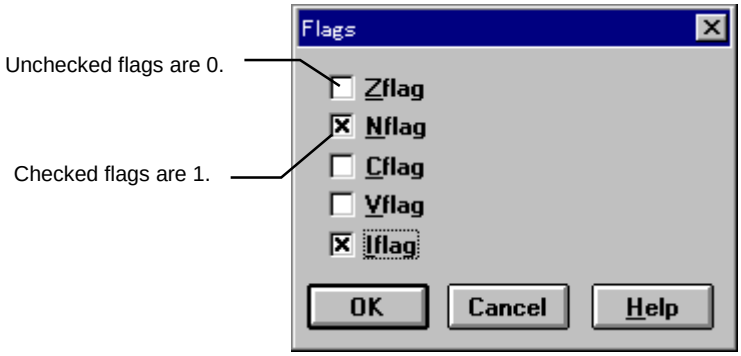
The [Register] dialog box is for modifying the contents of the selected register.



5.21.16 [Flags] Dialog Box

[Child(Register)]-[Change]

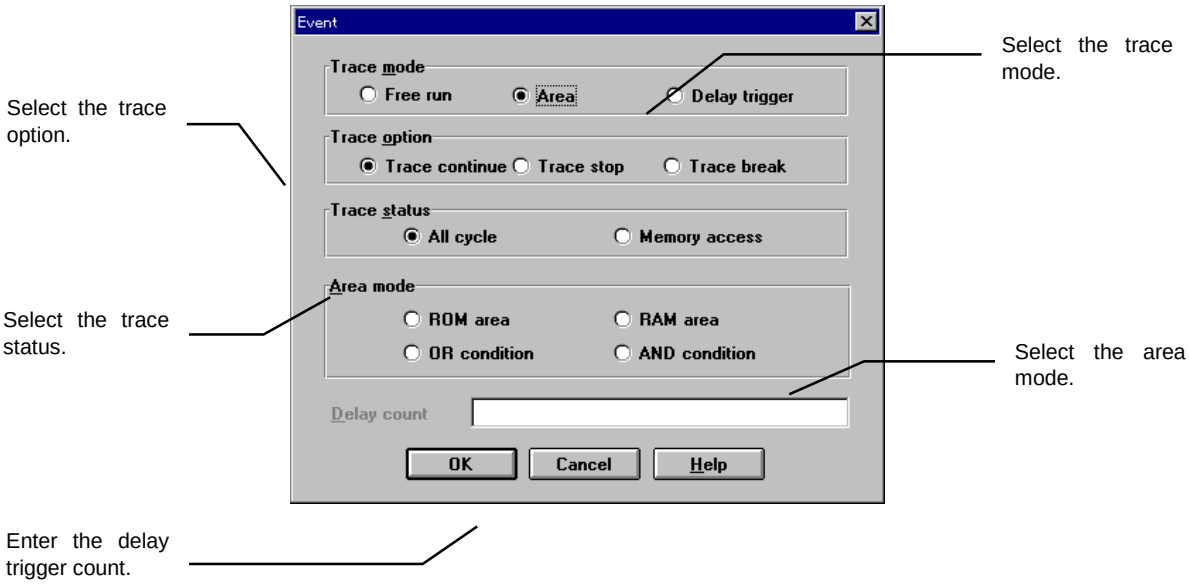
The [Flags] dialog box is for modifying the CPU flags.



5.21.17 [Event] Dialog Box

[Child(Trace)]-[Event]

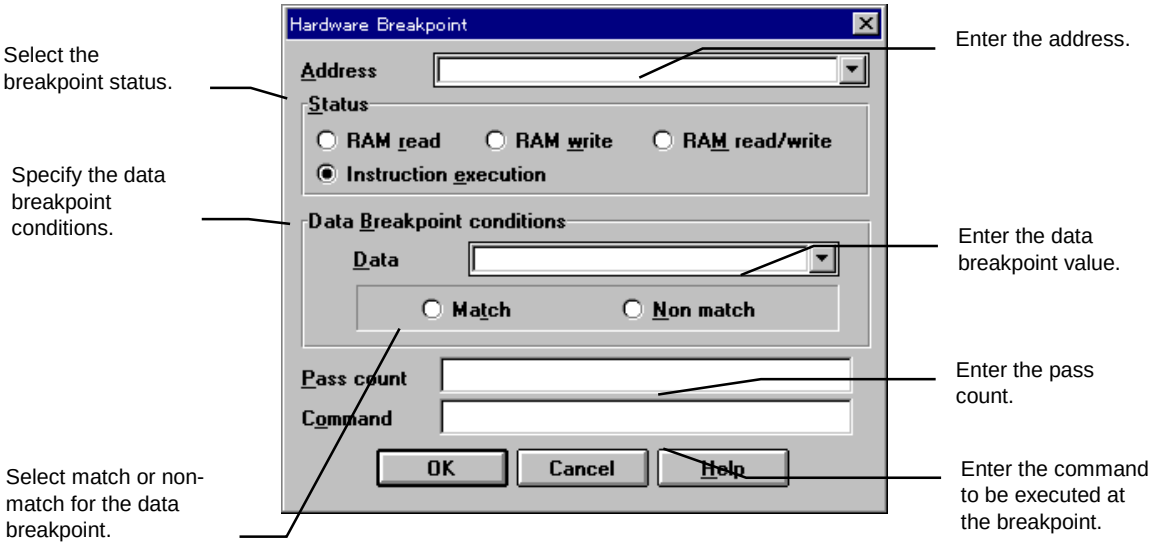
The [Event] dialog box is for specifying real-time trace events.



5.21.18 [Hardware Breakpoint] Dialog Box

[Child(Break)]-[Hardware breakpoint]

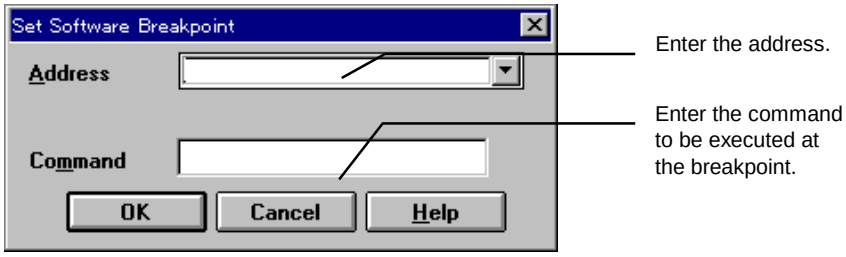
The [Hardware Breakpoint] dialog box is for setting up a hardware breakpoint.



5.21.19 [Set Software Breakpoint] Dialog Box

[Child(Break)]-[Add]

The [Set Software Breakpoint] dialog box is for setting up a software breakpoint.



5.21.20 [Jump Frame no.] Dialog Box

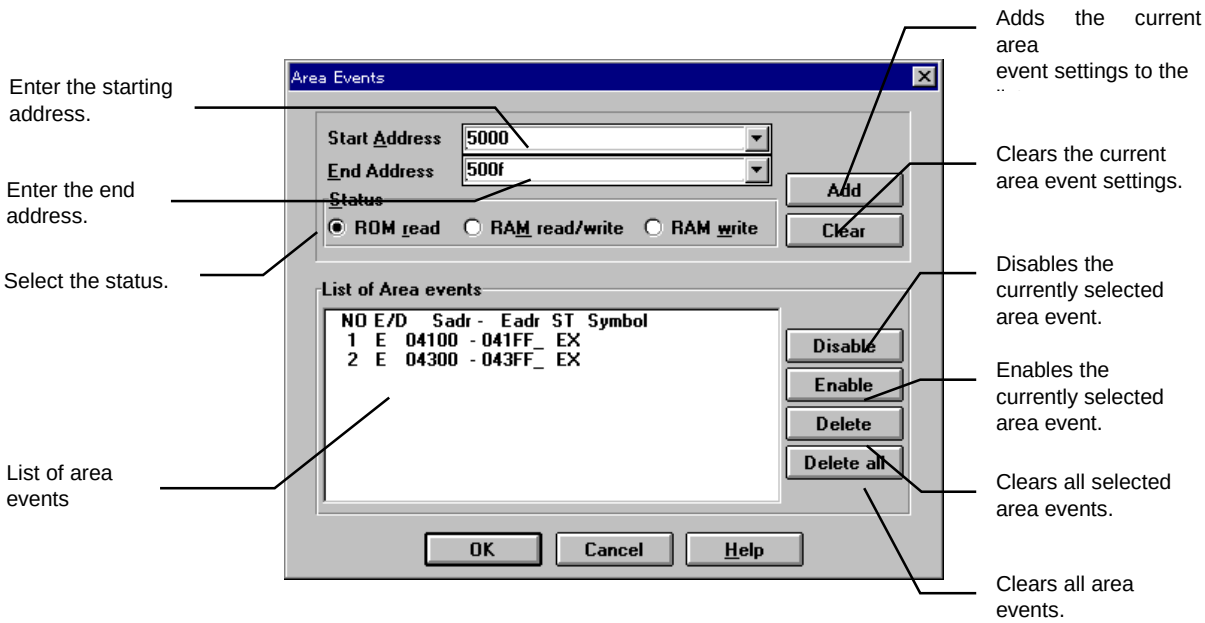
[Child(Trace)]-[Jump]

The [Jump Frame no.] dialog box is for specifying the starting frame number for the trace buffer display in the [Trace] window.

5.21.21 [Area Events] Dialog Box

[Child(Break)]/[Child(Trace)]-[Area events]

The [Area Events] dialog box is for managing area events.

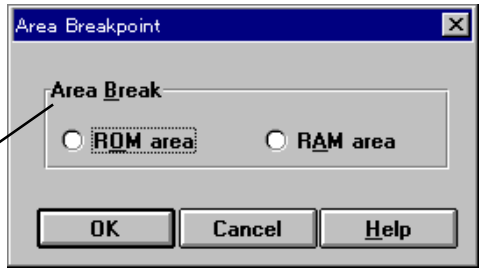


5.21.22 [Area Breakpoint] Dialog Box

[Child(Break)]-[Area breakpoint]

The [Area Breakpoint] dialog box is for setting area event conditions.

Select area event conditions.

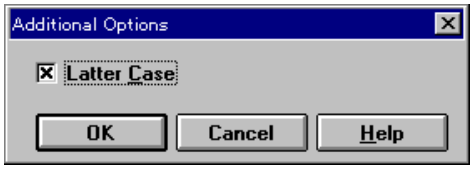


5.21.23 [Additional Options] Dialog Box

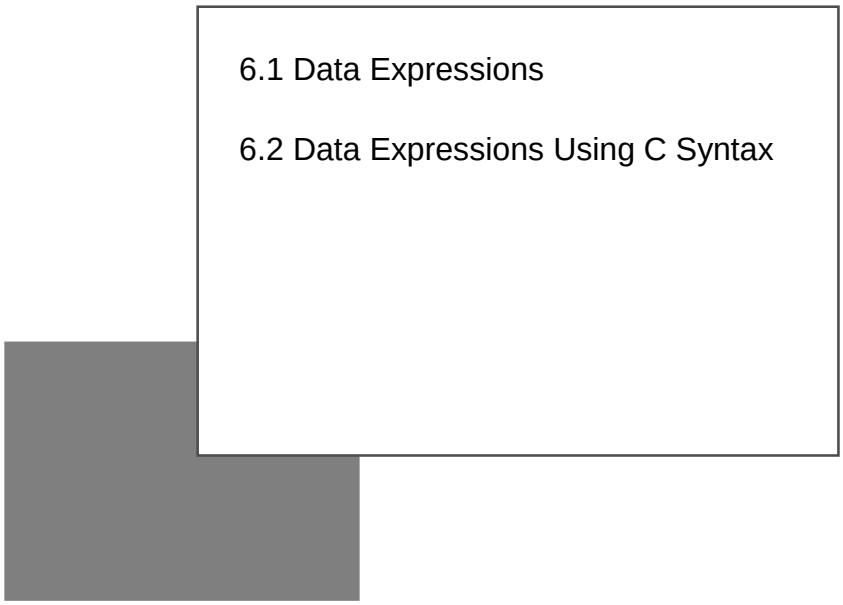
[Options]-[Option Set]

The [Additional Options] dialog box is for specifying C Source Code Debugger/Win options.

Checking this box makes case significant in symbol names.



Chapter 6.Dialog Command Data Expressions



6.1 Data Expressions

C Source Code Debugger/Win dialog commands are backward compatible with those of the MS-DOS version. The debugger supports a wide variety of symbolic and arithmetic expressions for specifying addresses and data.

6.1.1 Symbols

C Source Code Debugger/Win supports two types of symbols: global symbols, valid everywhere in the user program, and local symbols, valid only inside the current function.

6.1.2 Global Symbols

Global symbols may be used as address values for label and address input to disassemble commands. They include C extern variables and function names. C normally prefixes (or suffixes) variable names and function names with an underscore (_). Since entering this underscore each time that you enter a global symbol can get tiresome, C Source Code Debugger/Win allows you to omit it. It also allows you to choose whether or not to make case significant.

[■☞"OPTION command, [Options]-[Option Set"]

Note, however, that if a symbol has the same name as a CPU register, the CPU register takes precedence. In other words, you cannot access variables with the same names as CPU registers.

Using a global symbol to specify an address

```
>u _main          /*Disassemble starting at symbol _main */
>u main           /* Same as above */
```

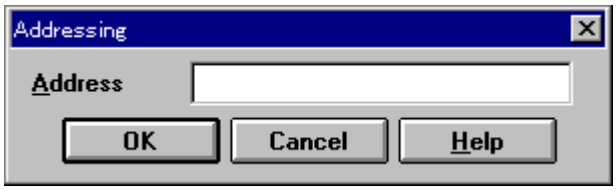


Figure 54. Using Symbol _main in [Addressing] Dialog Box

Using a global symbol inside a macro

```
>i=5                    /* 1 */
Defined symbol
>while{ i!=0            /* 2 */
?T                      /* 3 */
?i=i-1                  /* 4 */
?}                      /* 5 */
>
```

1. Assign the value 5 to the symbol i. (If i is undefined, the debugger defines it.)
2. Compare the value of symbol i to 0.
3. If i is nonzero, trace execution with the T command.
4. Subtract 1 from i and store the result back in i.
5. Terminate the while{ command. Execution of this line sends the debugger back to the while{ test in line 2.

Executing the above commands produces a while{ loop that executes the T command five times and then stops.

In the above example, the symbol i represents a variable similar to those in such high-level languages as C and BASIC. Note that this symbol must not have the same name as a previously defined global or local variable.

6.1.3 Local Symbols

Local symbols are variables that are only valid inside the function (i.e, automatic variables and function arguments) and variables declared static. The debugger automatically defines local symbols when it reads the debugging information.

In addition to their addresses, local symbols have a scope and a type (int, char, double, etc.).

6.1.4 Predefined Symbols

_ _ERR_ _

The debugger sets the predefined symbol __ERR__ to 1 when the previously executed command resulted in an error and to 0 otherwise.

Use this symbol to add error processing to macros.

_ _RUN_ _

The debugger sets the predefined symbol __RUN__ to 1 when the user program is running and to 0 during a break.

Use this symbol to detect user program breaks in macros.

6.1.5 Numerical Values

C Source Code Debugger/Win supports numbers in binary, octal, decimal, and hexadecimal notations and uses prefixes to distinguish between them. If there is no prefix, it uses the radix specified with the N command.

Notation	Meaning
@num	binary number
¥num	octal number
_num	decimal number
$num	hexadecimal number
0xnum	hexadecimal number
num	interpreted according to current radix (16 or 10)

For example, @11001010, ¥312, _202, $CA, and 0xCA all specify the same numerical value.

There are also commands (DS, DL, DT, SS, SL, and ST) that take floating point values.

6.1.6 Addresses

Commands and dialog boxes that take addresses as parameters accept as input not just direct address values, but also symbol names and, as described in the next section, line numbers.

6.1.7 Line Numbers

C Source Code Debugger/Win supports debugging at the source level using line numbers from the source file.

Line numbers are used to specify locations in source files. They are only available, however, when the debugging information loaded with the user program includes them. There are three formats for entering line numbers.

(1) .[file name:]line number

(2) .<plus_minus> line number

(3) .symbol<plus_minus> line number

These line number specifications consist of a decimal number (line number or number of lines) following a file name or symbol and specify a particular line in a source file for the program being debugged.

The first format specifies an absolute line number. If there is a file name, the specification indicates the specified line number in the specified file. Otherwise, it indicates the specified line number in the current file, the one displayed in the [Code] window.

```
>u.100                  /* Line 100 in the currently selected source file */
>u.sample:120           /* Line 120 in sample.c */
```

The second format expresses the target address as a line number relative to the source line currently containing the program counter (PC). A plus (+) indicates the line the specified number of lines after the current source line; a minus (-), the one the specified number of lines before. The format produces an input error if the specified line does not exist.

```
>v.+10                  /* 10 lines past the line containing the program counter
                           (PC) */
```

The third format expresses the target address as a line number relative to the specified symbol. A plus (+) indicates the line the specified number of lines after the symbol; a minus (-), the one the specified number of lines before. The format produces an input error if the specified line does not exist.

```
>bp.main+10             /* 10 lines past the symbol main */
```

6.1.8 Strings

C Source Code Debugger/Win supports the use of ASCII text strings instead of numerical values. Put such strings inside single quotes (').

```
‘A’ = $41
‘AB’ = $4142
‘ABCD’ = $41424344
```

The E/EB command, for example, accepts up to 16 such characters as input.

A single quote inside the string terminates it, causing the rest to be ignored. Use its numerical value (e.g., $27) instead.

6.1.9 Register Names

C Source Code Debugger/Win provides access to register and flag contents through symbols consisting of an underscore (_) plus the register or CPU flag name (A, DE, etc.).

The following registers and flags are available.

Register Names

D0,D1,D2,D3,DW0,DW1,A0,A1,SP,HA

PC,PSW

Flag Names

C,N,V,Z,I,IM

```
>while{ _D0!=_D1          /* Compare contents of D0 and D1 registers */
? T                       /* Trace execution command */
?}                        /* End of macro */
>
```

The above example executes the T (trace) command until the registers D0 and D1 contain the same value. Note that if a symbol has the same name as a CPU register, the CPU register takes precedence.

6.1.10 Arithmetic Expressions

Arithmetic expressions combine numerical values, symbols, and registers with operators to yield a single value. C Source Code Debugger/Win supports C-like numerical values and logical operators. Arithmetic expressions may be used anywhere that a command calls for data or an address. The following is a list of the unary and binary operators available for arithmetic expressions.

Unary operators		
	*	16-bit data at the specified address (pointer to word)
	+	unary plus
	-	unary minus
	~	NOT (1's complement)
	!	logical negation
Binary operators		
1	*	multiplication
1	/	division
1	%	modulo operation (remainder)
2	+	addition
2	-	subtraction
3	>>	right shift
3	<<	left shift
4	>=	comparison operator (1 when the right operand is greater than or equal to the left operand, 0 otherwise)
4	<=	comparison operator (1 when the right operand is less than or equal to the left operand, 0 otherwise)
4	>	comparison operator (1 when the right operand is greater than the left operand, 0 otherwise)
4	<	comparison operator (1 when the right operand is less than the left operand, 0 otherwise)
5	==	comparison operator (1 when the right operand is equal to the left operand, 0 otherwise)
5	!=	comparison operator (1 when the right operand is not equal to the left operand, 0 otherwise)
6	&	bitwise AND
7	^	bitwise XOR
8	|	bitwise OR
9	&&	logical AND
10	||	logical OR

System function VAL

The VAL dialog command evaluates the specified C expression.

The numbers on the left of each operator indicate operator precedence. If two operators have the same precedence, they group from left to right. Note, however, that parentheses may be used to override this precedence order.

Compare, logical AND and logical OR expressions are available for processing decision conditions for macro (for {, while { commands,etc) and condition decision commands (such as if { command). For the compare, logical AND and logical OR instructions, only the lower 16 bits are subject to operation.

```
>h -(1+2*3)
          oct          dec            hex       asc          float
    37777777771             -7    FFFFFFF9   '....'    -6.805644e++38
>
```

6.2 Data Expressions Using C Syntax

Section 6.1 "Data Expressions" described how assembler-like expressions based on global symbols, local symbols, and line numbers may be used to express addresses. These expressions are supported by virtually all dialog commands. The program being debugged, however, uses expressions following C syntax, and these expressions cover a wider range. C Source Code Debugger/Win therefore adds support for C syntax to the following dialog and window commands: inspect commands, watch commands, VAL command, and ? command.

6.2.1 C Expressions

Commands that support C syntax interpret expressions differently from those using the syntax described in Section 6.1 "Data Expressions." To see the difference, consider the following expressions based on the C global variable abc.

```
>d abc          /* Display memory starting at variable abc */
3628 00 01 02 03 .....
>d abc+10       /* Display memory starting at address 10 bytes past variable abc */
3638 AA BB CC DD .....
>? abc          /* Display value of variable abc (expression evaluated using C syntax) */
(int) 1 (0x1)
>? abc+10       /* Display value of variable abc plus 10 (expression evaluated using C syntax) */
(int) 11 (0xB)
>
```

This example illustrates how the same expressions abc and abc+10 have different meanings depending on whether they are evaluated with assembler (D command) or C (? command) syntax. The inspect commands, watch commands, VAL command, and ? command interpret abc as a C variable. The other commands interpret it as an address.

6.2.2 C Variables

These C expressions may use any of the variables and functions declared in source files compiled with the options for including detailed debugging information in output files. They may also use the following pseudo-variables for registers and flags. These pseudo-variables are of type unsigned int.

Register Pseudo-Variable	Register/Flag
_D0	D0 register
_D1	D1 register
_D2	D2 register
_D3	D3 register
_DW0	DW0 register
_DW1	DW1 register
_A0	A0 register
_A1	A1 register
_SP	SP register
_HA	HA register
_PC	PC register
_PSW	PSW register
_C	C flag
_N	N flag
_V	V flag
_Z	Z flag
_I	I flag
_IM	IM flag

6.2.3 Scope of C Variables

When creating and debugging C programs, the programmer must be mindful of each variable's scope, the range where it may be used. A variable declared with the extern modifier, for example, is valid everywhere in the program. In other words, its scope is the entire program. An automatic variable declared within a function, in contrast, is only valid for the duration of the function. Its scope is limited to that function. If there are variables of both types with the same name, only the latter is valid inside the function. The former is not accessible. Outside the function, however, the latter no longer exists anywhere in memory, so is not accessible.

C Source Code Debugger/Win automatically supports C variable scope based on scope information contained in the debugging information.

6.2.4 Constants

Constants follow the C specifications. The default radix is always 10 regardless of any setting made with the N command for modifying the radix.

Notation	Radix
num	10
0xnum	16
0Xnum	16
0num	8

For example, 4096 (decimal), 0x1000 (hexadecimal), and 010000 (octal) all represent the same value. C escape sequences may be used to define character constants.

C Character	Numerical Value	Meaning
'¥a'	0x7	Bell
'¥b'	0x8	Backspace
'¥f'	0xC	Form feed
'¥n'	0xA	Line feed
'¥r'	0xD	Return
'¥t'	0x9	Horizontal tab
'¥v'	0xB	Vertical tab
'¥¥'	0x5C	Backslash
'¥nnn'	nnn	Octal number (8-bit)
'¥xnn'	nn	Hexadecimal number (8-bit)

6.2.5 Operators

C Source Code Debugger/Win supports C operators and C operator syntax. It supports all operators except the assignment operators for floating point values.

The operators have the following precedence.

Precedence Level	Operators
1	function(n) array[n] n.n n->n n++ n--
2	&n *n -n ~n !n ++n --n sizeof n
3	(cast) n
4	n%n n/n n*n
5	n+n n-n
6	n<<n n>>n
7	n>n n<n n>=n n<=n
8	n==n n!=n
9	n&n
10	n^n
11	n|n
12	n&&n
13	n||n
14	nn?nn:nn
15	n=n n*=n n/=n n%=n n+=n n-=n n<<=n n>>=n n&=n n^=n n|=n
16	n, n

If two operators have the same precedence, they group from left to right. Note, however, that only the assignment operators (precedence level 16) group from right to left, and that parentheses may be used to override this precedence order.

6.2.6 Expressions with Side Effects

C expressions containing ++, --, =, assignment operators, or function calls have side effects<em_dash>that is, they change the contents of variables. While there are times when you may wish to deliberately change the contents of a variable with an assignment operator, debugging usually just means viewing the contents of variables. There is relatively little call for modification.

To prevent accidental modification of variables as the result of expression evaluation, therefore, C Source Code Debugger/Win blocks C expressions containing operators with side effects from the watch, inspect, and ? commands. Only the VAL command permits them. If your primary interest is merely viewing data, stick to the ? and inspect commands. Save the VAL command for when you deliberately wish to use operators that have side effects.

Function calls are even more dangerous since a function may very well modify global variables, static variables, or, via pointers, other data areas that do not appear in the expression. If you are not careful, it may even become impossible to resume program execution. Be extremely careful when using the VAL command to evaluate an expression containing a function call.

```
>? abc=1234
Operators with side effects not allowed.
>val abc=1234                /* Set abc to 1234 */
(int) 1234 (0x4D2)
>val fnc(1,2,3)              /* Call function fnc */
(int) 10 (0xA)
>
```

Chapter 7. Dialog Command Reference

7.1 Command Description Conventions

7.2 Commands Grouped by Function

7.1 Command Description Conventions

C Source Code Debugger/Win commands consist of a command name followed by a parameter list. Sometimes a parameter can be omitted. Such a parameter appears in square brackets ([...]). A parameter offering two or more choices appears in braces ({...}) with bars (|) separating the choices. When a parameter is omitted, C Source Code Debugger/Win substitutes a default value or one based on a previously executed command.

,	Parameter delimiter
[...]	Optional parameter
{A|B}	Choice of A or B
ABCD	Underlining indicates key input.

7.2 Commands Grouped by Function

7.2.1 Loading User Program

L [<file name>] Reads in the user program to be debugged and the debugging information.

LP [<file name>] Reads in the user program to be debugged only.

7.2.2 Running User Program

T [<count>] Traces execution of the user program. (F8)

P [<count>] Single-steps through the user program. (F10)

G [=<execution address>][<breakpoint address>][,/W]

Runs the user program. (F5, F7)

/W Disables on-the-fly functions.

RESET Resets the target chip.

7.2.3 Breakpoint Commands

BP [<address>][,<status>[,<data>][,/N]][,/<count>][,/C<command>]

Set a breakpoint at the specified address. (F9)

<status> EX: instruction execution hardware breakpoint

RW: RAM read/write

R: RAM read

W: RAM write

(blank): software breakpoint

/N Breaks on mismatch with the specified data.

/C<command> Automatically executes the specified command at the breakpoint.

BP PAREA Sets up a ROM area breakpoint.

BP DAREA Sets up a RAM area breakpoint.

BP EXT Sets up an external breakpoint.

BPS S:<list>,E:<list>[,/B]

Sets up the specified list of breakpoints as a sequential event. A sequential event may be used for partial time measurement.

S: First event condition.

E: Second event condition.

/B Sets up the specified list of breakpoints as a sequential event.

BPA <list> Sets up the specified list of breakpoints as an AND breakpoint.

BC <list> Cancels the specified list of breakpoints.

BD <list>	Disables the specified list of breakpoints.
BE <list>	Enables the specified list of breakpoints.

7.2.4 Area Event Commands

AREA [<range>[,<mode>]]

Sets up an area event for the specified range.

<mode>	EX: ROM read area event
	RW: RAM read/write area event
	W: RAM write area event
	(blank): ROM read area event

AREAC <list>	Cancels the specified list of area events.
AREAD <list>	Disables the specified list of area events.
AREAE <list>	Enables the specified list of area events.

7.2.5 Real-Time Tracing Commands

TD[U]	Switches to the mode for displaying real-time trace data. Adding 'U' switches to the disassembler output mode.

Subcommands available in real-time trace display mode

[-]B	Moves the display's starting frame to the beginning (end) of trace memory.
N <address>	Moves the display's starting frame to the specified address.
D [<range>]	Displays the frame range data in hexadecimal.
U [<range>]	Displays the frame range data in hexadecimal and as disassembler output.
TDW	Displays the real-time trace data in window mode.

7.2.6 Hardware-Related Commands

SM [<address>]	Specifies/displays the sample area.
SMB <address>	Specifies the address for displaying in bits.
SMC <address>	Clears the address for displaying in bits.
PROF [<mode>]	Displays statistics on subroutine access. (profiler)
<mode>	ON: Turns profiler ON.
	OFF: Turns profiler OFF.
	CLR: Clears profiler statistics.
TG	Resumes tracing.
TI [<mode>]	Sets up/displays timer mode.
<mode>	RUN: Measures time elapsed from program start to stop.
	PAR1: Measures time elapsed up to first sequential event.
	MAX: Measures time elapsed for repeated sequential events and determines maximum value.
	STOP: Terminates timer mode.
TM [<mode>][,/T[<count>]][,<status>][,<option>]	
	Sets up/displays trace mode.
<mode>	PAREA: ROM area trace mode
	DAREA: RAM area trace mode
	ORAREA: ROM and RAM area OR condition trace mode
	ANDAREA: ROM and RAM area AND condition trace mode
/T[<count>]	Traces specified number of times after trigger condition detected and then stops.
<status>	MEM: Memory access trace mode
	ALL: All cycle trace mode
<option>	/B: Breaks when trace memory is full.
	/C: Continues tracing until program stops.
	/S: Stops only tracing when the trace memory is full. Does not stop the user program.
TM /F	Sets up free-running trace mode.
TRIG [<mode>]	Sets up/displays external trigger output.
<mode>	ON: Enables trigger.
	OFF: Disables trigger.
TS	Stops tracing.
EXI <expanded area>	Assigns expanded memory to memory inside the emulator.
<expanded area>	
	ROM: Expanded ROM area

RAM: Expanded RAM area

EXE <range> Assigns expanded memory to user target resources.

<expanded area>

ROM: Expanded ROM area

RAM: Expanded RAM area

EX Display settings.

7.2.7 Displaying/Modifying Registers

R Displays contents of all register and flags.

<register>+REG=<value> Sets the specified register to value of expression.

<flag>+FLG=<value> Sets the specified flag to value of expression.

R <register> Modifies contents of specified register or CPU flag.

7.2.8 Displaying/Modifying Memory

D[<type>] [<range>][,<display count>][,<radix>]

Displays the contents of the specified range with the specified radix.

<type> B: Byte (8-bit) data

W: Word (16-bit) data

D: Double word (32-bit) data

S: 4-byte real number (short float) data

L: 8-byte real number (long float) data

A: ASCII data

<radix> /H: Hexadecimal display

/D: Decimal display

/O: Octal display

E[<type>] [<address>][<data>]

Modifies memory starting at the specified address using the specified data type.

<type> B: Byte (8-bit) data

W: Word (16-bit) data

D: Double word (32-bit) data

S: 4-byte real number (short float) data

E: Nybble (4-bit) data

F[<type>] <range>,<data>

Fills the specified range with data of the specified type.

<type> B: Byte (8-bit) data

W: Word (16-bit) data

D: Double word (32-bit) data

S[<type>] <range>,<list>

Searches the specified range for the specified memory pattern using the specified format.

<type> B: Byte (8-bit) data

W: Word (16-bit) data

D: Double word (32-bit) data

C <range>,<address> Compares the specified range with the range starting at the specified address.

M <range>,<address> Moves the data in the specified range to the block starting at the specified address.

7.2.9 Assemble Command

A[<address>] Begins assembly at the specified address.

7.2.10 Radix Command

N {10|16} Sets the input radix to decimal or hexadecimal.

7.2.11 Displaying Expressions

H <expression> Displays the value of the expression in octal, decimal, hexadecimal, ASCII, and real number formats.

H <expression 1>, <expression 2>

Displays the sum and difference of the two expressions.

PF/PRINTF <format>[,<parameter>]

Displays the specified parameters using C's printf() function.

7.2.12 Reading/Writing Files

RD <file name>,<address>

Reads the specified file into memory starting at the specified address.

WR <file name>,<range>

Writes the contents of the specified memory range to the specified file.

7.2.13 System Commands

EXIT/Q [<exit code>]

Exits C Source Code Debugger/Win and returns to MS-DOS.

!! Displays the command history.

!<text> Selects the last command beginning with the specified text from the command history.

HELP Displays the on-line help.

7.2.14 Displaying/Modifying Symbols

X [<symbol name>] Displays the definition for the specified symbol (or all symbol definitions if there is no parameter).

[.]<symbol name> Defines or resets the specified symbol to the specified value.

7.2.15 Displaying Code

V[.][<file name>:][<line>]

Displays the specified line in the specified file in a [Code] window.

V <symbol name> Displays the source file containing the specified symbol in a [Code] window.

U [<address>] Displays disassembler output starting from the specified address in a [Code] window.

UPUSH [<address>] Pushes the current display address onto the address stack and displays disassembler output starting from the specified address.

UPOP Pops an address off the address stack and displays disassembler output starting from that specified address.

UEND Displays disassembler output starting from the last address pushed onto the address stack.

UX [<address>] Displays disassembler output starting from the specified address in the [Command] window.

K Backtraces the function call history.

7.2.16 Displaying/Modifying C Data

INS <C expression>[,<function name>]

Evaluates the specified C expression and displays the result in the [Inspect] window.

W? <C expression> Adds the C expression to the [Watch] window.

W[<type>] <address>[,<count>][,<radix>]

Adds the specified address to the [Watch] window.

<type> B: Byte (8-bit) data

W: Word (16-bit) data

D: Double word (32-bit) data

A: ASCII data

?: C expression display

<radix> /H: Hexadecimal display

/D: Decimal display

/O: Octal display

Y <list> Deletes the specified watch line(s).

WM <list> Displays the specified watch line(s) in the [RAM Monitor] window.

VAL/? <C expression>[,<function name>]

Evaluates the specified C expression and displays the result.

7.2.17 Setting Options

OPTION <reg> [,<code>[,<case>]]

Sets options. (Shift+F10)

<reg>	{ON|OFF}: Switches the [Register] window display on and off.
<code>	{SRC|ASM}: Switches the [Code] window display between source code and disassembler output.
<case>	{ON|OFF}: Switches case significance for symbol names on and off.

7.2.18 Memo Commands

MEM<number>[,<text>]

Writes the specified text to the specified memo number.

MEM	Displays the contents of the current memo.
MEM *	Deletes all current memos.

7.2.19 Logging/Running Batch Commands

> {file name}	Logs [Command] window displays and input to the specified file, overwriting the file.
>> {file name}	Logs [Command] window displays and input to the end of the specified file.
>	Suspends logging and closes the log file.
< {file name}	Takes [Command] window input from the specified file. Use the ESC key to interrupt such batch processing.

7.2.20 Screen Control/Miscellaneous Commands

*	Adds a comment line.
BEL	Sounds the buzzer.
CLS	Clears the [Command] window.
HOME	Moves the [Command] window cursor to the home position.
LALL	Enables display output during macro execution.
SALL	Disables display output during macro execution.
LIST	Enables [Command] window display output.
NLIST	Disables [Command] window display output.
PRMPT <character>	Changes the prompt to the specified character.
TIME	Displays the current time in hh:mm:ss format.
WAIT	Pause.

7.2.21 Predefined Symbols

_ _ERR_ _	The debugger sets this to 1 when the previously executed command resulted in an error and to 0 otherwise.
_ _RUN_ _	The debugger sets this to 1 when the user program is running and to 0 during a break.
_ _DEBINF_ _	Undefines all symbols.

7.2.22 Macro Commands

{<macro name>	Defines a macro with the specified name.
DO{}WHILE <expression>	Adds C-like do..while control statement to macro.
FOR{}	Adds C-like for control statement to macro.
WHILE{<expression>	Adds C-like while control statement to macro.
REPEAT{<parameter>	Adds repeat loop to macro.
BREAK	Breaks out of macro.
KILL <macro name>	Deletes the specified macro.
MLIST [<macro name>]	Lists macro(s).
MLIST >{file name}	Writes all currently defined macros to the specified file.
<{file name}	Loads macros from specified macro file.
IF{<expression>	Adds C-like if..elseif..else control statement to macro.

Chapter 8. Appendices

8.1 In-Circuit Emulator Specifications

8.2 Configuring Interface Board

8.3 Error Messages

8.1 In-Circuit Emulator Specifications

8.1.1 Functional Specifications

Item		Specifications
Target device	MN101Cxx series	
Memory capacity	Emulation memory	224 kilobytes
Breakpoint functions	ROM breakpoint	Maximum of 4 events. Conditions: Area specification, pass count specification
	RAM breakpoint	Maximum of 4 events. Conditions: Area specification, pass count specification, bit mask, read/write/access specification, match/mismatch specification, AND condition specification. Two levels.
	Sequential breakpoint	Two levels.
	Trace breakpoint	
	RAM access violation breakpoint	One bit
	External breakpoint	
Trace functions	Trace memory size	511 steps
	Trace get data	ROM address, RAM address, RAM data, R/W
	Trace mode	Normal mode, ROM/RAM area mode, delayed trigger mode
Timer functions	Measurement modes	Execution time measurement mode, maximum execution time measurement mode
	Time measurement resolution	100 ns
Trigger output functions	Trigger output	One output
RAM monitor function	Sample memory	32 bytes
	Display modes	Dump list mode, bit map mode
Performance evaluation	Profiler	Displays execution shares (%)

functions		
Clock	OSC1, XI	Emulator side, target side (separately excited oscillation only)

8.1.2 Electrical Specifications

Item	Rating
Emulator and probe power supply voltage	0.5 to 0.6 V
EXT. BREAK. input voltage	-0.3 to 5.5 V
Trigger output voltage	-0.3 to 5.5 V
Trigger output current	<plus_minus>10 mA

8.1.3 Environment Specifications

Item		Rating
Temperature	Operation	10°C to 30°C
	Storage	0°C to 45°C
Humidity	Operation	20% t o 80%
	Storage	90% max

8.1.4 External Dimensions

Item	Rating
Length x width x height	130 x 100 x 40 mm

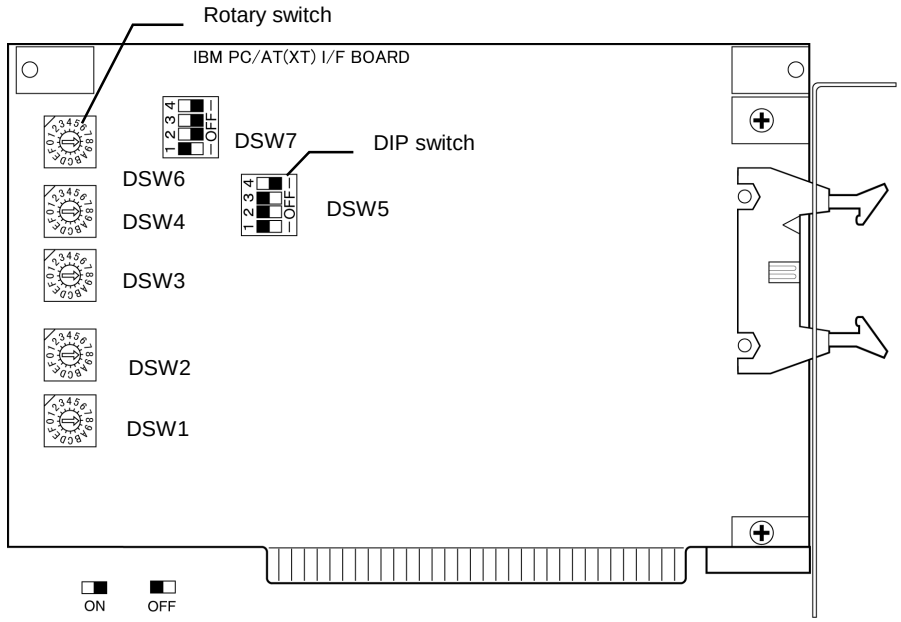
8.2 Configuring Interface Board

The interface between the host computer and the in-circuit emulator uses one byte in the host computer's I/O space. Only the lowest eight bits of the I/O address are decoded. The board uses the upper eight bits. Set the switches on the interface board to match the system used.

The I/O address may be any unused address, but normally use an address from the tables below.

The interface boards include a no-fuse circuit breaker to prevent overcurrents from the 5-volt power supply from damaging the board. If, for any reason, there is an overcurrent, the white button pops out to shut off the current. Before resetting the no-fuse circuit breaker by pressing in the button, always investigate the cause first. Be careful not to press too firmly on the button. When the button has popped out, it protrudes approximately 1 or 2 mm from the top of the no-fuse circuit breaker.

Interface Board for PC/AT



DIP switch (DSW5, 7) settings

	1	2	3	4
DSW5	OFF	OFF	OFF	ON
DSW7	OFF	ON	ON	ON

Rotary switch (DSW1, 2, 3, 4, 6) settings

I/O address	DSW3	DSW2	DSW1	DSW4	DSW6
0300H	3	0	0	-	-
0301H	3	0	1	-	-
:	:	:	:	:	:
030FH	3	0	F	-	-
0310H	3	1	0	-	-
0311H	3	1	1	-	-
:	:	:	:	:	:
03FFH	3	F	F	-	-

Note: Dashes indicate that the setting does not matter.

Set the I/O address to an unused address between x300H and x3FFH.

8.3 Error Messages

C Source Code Debugger/Win displays an error message when it detects an error in a user command. The following lists possible error messages and their meanings.

Address error

This message appears when the address input field contains an improper address specification, when the starting and end addresses are reversed, and when the input uses an undefined symbol.

Illegal instruction breakpoint

The device executed an illegal instruction. Use the real-time trace function to determine the address of the problem instruction.

Cannot add watch variable. (max: 16)

There are too many watch variables. The limit is 16.

Illegal operand

An assembler instruction entered with the A command has an error in operand syntax.

Invalid environment

A problem with the environment settings prevents loading the user program.

Invalid function format

The function is in a format not supported by C Source Code Debugger/Win.

Invalid function name

Either the specified function is not in the symbol table or a local symbol (automatic variable) was not declared at the beginning of the function.

Command error

C Source Code Debugger/Win does not recognize the specified command as an internal command or macro.

Invalid command format

There is a mistake in input format, parameter specifications, or number of parameters for the command.

Sampling data not available.

This message appears when you attempt to display profiler statistics before running the profiler.

No such setting.

There is an error in the breakpoint number specification.

Cannot find specified file.

The debugger cannot find the file specified on the command line.

Cannot open specified file.

The debugger cannot open the specified file. Check whether the file actually exists. This message also appears when you have too many files open.

Error evaluating C expression.

The ? and VAL commands display this error when there is an error in the C expression.

Cannot find C variable.

The ? and VAL commands display this error when they cannot find the specified C variable.

Cannot start in STOP or HALT mode.

The CPU is in STOP or HALT mode. Before user program execution can resume, you must modify the contents of the CPU mode register.

Source line buffer full.

The debugger has run out of space for source line information. Restart C Source Code Debugger/Win using the -B command line option to specify a larger buffer.

Target reset on. Monitor program inoperative.

Check probe and installation.

Make sure that the model number specified with the Pset101C command matches that on the evaluation chip.

Disk full.

There is not enough free space on the specified disk.

Data specification error

This message indicates an illegal data value in the input or a value that is out of range.

Debugging information missing.

The debugger found no debugging information in the executable file (Matsushita .ex format) loaded with the L command.

Invalid debugging information format

The debugging information in the user program is not in the proper format.

Debugging information buffer full.

The debugger has run out of space for debugging information. Restart C Source Code Debugger/Win using the -B command line option to specify a larger buffer.

PICE internal error

This message indicates a problem within C Source Code Debugger/Win. It should not normally appear. If it appears in a reproducible fashion, contact your nearest Matsushita representative.

Cannot create file.

Either the disk is full or there are too many files open. Try closing unnecessary files.

Operators with side effects not allowed.

The ? command does not allow the use of operators with side effects (=, +=, -=, etc.). If you are willing to accept side effects, use the VAL command instead.

Cannot set breakpoint. (max: 16)

There are too many software breakpoints either alone or in combination with hardware breakpoints. The limit is 16.

Verify error.

A write to memory failed. This message indicates an attempt to write to memory that is not physically present.

Cannot find HELP file.

PT101C.HLP file cannot be found. Load PT101C.HLP file in the current directory or the directory specified with environment variable HELP.

Microcomputer out of control.

The user program has run out of control while executing. Check stack usage, interrupt service routines, etc.

Other possible causes include problems with the power supply, oscillator, and cable connections. Try resetting the device.

Macro nesting limit exceeded. (max: 15)

C Source Code Debugger/Win only supports macro nesting up to 15 levels deep.

Missing } in macro definition.

The braces ({}) in a macro definition do not match.

Cannot delete macro inside macro.

Delete the macro definition at the C Source Code Debugger/Win command level. Macros cannot delete other macros.

Cannot define macro inside macro.

Define the macro definition at the C Source Code Debugger/Win command level. Macros cannot define other macros.

Macro buffer full

Either the buffer for macro definitions is full or there are too many macros defined. Restart C Source Code Debugger/Win using the -B command line option to specify a larger buffer.

Macro name same as internal command.

The macro definition uses a name that matches a C Source Code Debugger/Win internal command. Use a different name.

Out of memory.

There is not enough memory available. Restart C Source Code Debugger/Win using the -B command line option to specify smaller buffers.

Cannot find monitor program (MON101C.EX).

The debugger needs the monitor program (MON101C.EX) to start, but cannot load the file. Copy the MON101C.EX file in the current directory or the directory specified with PAHT.

Check power supply, interface board, and addresses.

Make sure that the power supply to the in-circuit emulator is on. Make sure that the probe and pod switch settings match. Make sure that the I/O address of the interface board matches that specified with the Pset101C command. Check the interface board address for conflicts with other boards, EMS memory, RAM disks, and the like.

Cannot define local symbol.

This message appears when you attempt to define a global symbol with the same name as an existing local symbol.

Local symbol buffer full.

The buffer for local symbols (automatic variables) is full. Restart C Source Code Debugger/Win using the -B command line option to specify a larger buffer.

Cannot find local variable.

You have used a symbol name that has not been defined as a local symbol.

Failure to get chip bus. (Evaluation chip serial error)

Check the power supply, oscillator, and cable connections.

Failure to release chip bus. (Evaluation chip serial error)

Check power supply, oscillator, and cable connections.

There was an error while the microcomputer (pod and probe) was communicating with the device.

Check the power supply, oscillator, and cable connections. If such errors persist, contact your nearest Matsushita representative.

Failure to stop program at single step

Run RESET command.

There is no RTS instruction matching a JSR instruction.

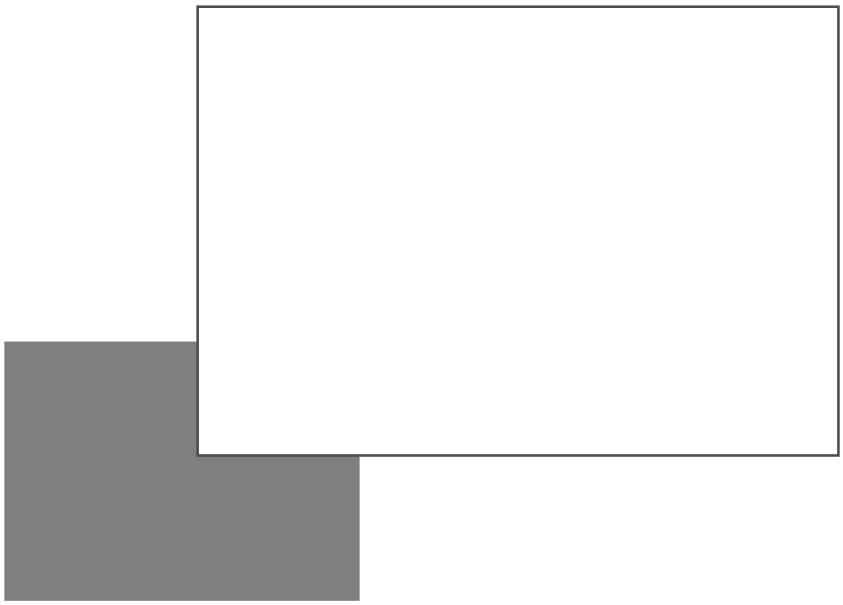
Failure to get mail.

There has been a serial error. Check the cable connections between the in-circuit emulator and the POD.

mailflg is not zero.

If this message persists even though the cable connections are solid, contact your nearest Matsushita representative.

INDEX



Symbols

! command 149

!! command 149

* command 151

. command 150

? command 82, 151

{<macro name> command 152

< command 151

<{file name}command 152

>{file name} command 151

>> command 151

A

A command 149

[About...]command 73

[Add]command 99, 101

[Additional Options]dialog box 129

[Address]command 83, 97, 111

[Address Set]command 89

[Addresses]command 93

[Addressing]dialog box 123, 124

[Add to AND condition]command 101

[All Clear]command 99

Appendices 153

AREA command 146

[Area breakpoint]command 101

[Area Breakpoint]dialog box 129

Area event commands 146

[Area events]command 101

[Area Events]dialog box 128

AREAC command 146

AREAD command 146

AREAE command 146

Arithmetic expressions 136

[Arrange]command 72

Assemble 55

Assemble command 149

Auto-execute file 44

B

Back up floppy disk 26

[BackTrace]window 96

- Local menu 70, 97
- Mouse Operations 97
- Shortcut Keys 96

Basic Operating Procedure 20

BC command 145

BD command 146

BE command 146

BEL command 151

[Bit]command 111

[Bottom]command 83, 104

BP command 81, 84, 145

BPA command 145

BPS command 145

BREAK command 152

Breakpoint Commands 145

Breakpoints 18

[Break]window 100

- Local menu 70, 101
- Mouse Operations 102
- Shortcut Keys 100

Button 113, 115

[Byte]command 89, 111

C

C command 149

C Expressions 138

C Variables 139

[Cascade]command 72

[Change]command 91, 106

[Char(ASCII)]command 89

[Clear]command 99, 101

[Clear All]command 65, 109

CLS command 151

[Code]window....80
Local menu....68, 83
Mouse Operations....84
Shortcut Keys....81
[Color]dialog box....120
[Come]command....67, 83
Command Description Conventions....144
[Command History]dialog box....123
Command History file....45
[Command History]window....45
Command line....48
Command reference....143
Commands grouped by function....145
[Command]window....85
Local menu....68, 87
Shortcut Keys....85
Compile....55
Configuring Interface Board....156
Connect in-circuit emulator....26
Constants....140
Convert to ROM....55
[Copy]command....65, 109
[Copy Page]command....65
Copying files....33
Create a shortcut....37
Create a New Environment....40
Modifing an Existing Environment....43
Upgrading from MS-DOS<R>Version....42
Create environment settings file....37, 46
Create a New Environment....39
Modify an Existing Environment....43
[Custm ToolBar]command....73
[Cut]command....65, 109

D

D command....148
Data Expressions....131
Data Expressions Using C Syntax....138
Debugger Does Not Load....52
Debugger features....14
Debugger overview....13, 168
[Decimal]command....89, 91, 111
[Decrement]command....91
[Delete]command....65, 109
Dialog Boxes....117
[Directory]window....30
[Disable/Enable]command....101
[Disassemble]command....83
[Disassemble/Dump]command....104
[Disk]menu....30
Displaying Code....150
Displaying Expressions....149
Displaying/Modifying Registers....148
Displaying/Modifying C Data....150
Displaying/Modifying Memory....148
Displaying/Modifying Symbols....150
DO{}WHILE command....152
[Double word]command....89

E

E command....148
[Edit]command....89
[Edit]menu....65
Electrical Specifications....155
[Element]command....95, 99
ENV101C.TXT....39, 45, 46
[Environment Settings]dialog box....46
Environment settings file....37, 39, 41, 44, 46
Environment Specifications....155
Error messages....52, 158
[Event]command....104
[Event]dialog box....126
EX command....148
EXE command....148
EXI command....147
[Exit]command....64
EXIT/Q command....149
[Exp. Sym]command....87

[Expand Symbol]dialog box....124
Expressions with Side Effects....142
[External breakpoint]command....101
External dimensions....155

F

F command....148
[File Focus]command....84
[File Open]dialog box....117
Files Saved at Exit....45
[File]menu....64
Files Necessary for Loading....44
[Find]command....66
[Find String]dialog box....120
[Flags]dialog box....126
[Flip]command....84
[Flyover Hints]command....66
[Font]dialog box....118
[Font Select]command....73
FOR{} command....152
[Forcible Break]command....67
[Function Focus]command....84
[Function step]command....67
Functional Specifications....154

G

G command....81, 145
Global Symblos....131
[Go]command....67

H

H command....149
Hardware....16
[Hardware breakpoins]command....101
[Hardware Breakpoint]dialog box....127
Hardware-Related Commands....147
HELP command....149
[Help contents]command....73
help file....45
[Help on help]command....73
[Help]menu....73
[Hexadecimal]command....89, 111
[History]command....87
HOME command....151

I

IF{ command....152
Important Notes....16
In-Circuit Emulator Specifications....154
[Increment]command....91
INI file....44
INIT.MCR....44
INS command....81, 84, 150
[Inspect]command....83, 95, 97, 99, 106
[Inspect]window....105
Local menu....71, 106
Mouse Operations....106
Shortcut Keys....105
Installation....20, 25, 169
[Installation Directories]dialog box....33
Instruction set help file....45
Interface Board for PC/AT Series....157
Interface board-installation....26, 46, 156
Interrupting Installation....35

J

[Jump]command....104
[Jump Frame no.]dialog box....128

K

K command....150
[Keyword Search]command....73
KILL command....152

L

L command....145
LALL command....151
Left button drag....78

[Line no]command....83
Line Numbers....134
Linking....56
LIST command....151
[Load]command....64, 87
[Load Setting]command....101
Load the Debugger....51
Loading User Program Commands....145
Local menu....68
Local menu
[BackTrace]window....70, 97
[Break]window....70, 101
[Code]window....68, 83
[Command]window....68, 87
[Inspect]window....71, 106
[Local]window....69, 95
[Memory]window....69, 89
[Memo]window....70, 109
[RAM Monitor]window....71, 111
[Register]window....69, 91
[Stack]window....69, 92
[Trace]window....71, 104
[Watch]window....70, 99
Local Symbols....132
[Local]window....94
Local menu....69, 95
Mouse Operations....95
Shortcut Keys....94
Logging/Running Batch Commands....151
[Long Floats]command....89
LP command....145

M

M command....149
Macro Commands....152
Macros....15
[Main]window....61
[Make sequential breakpoint condition 1]command....101
[Make sequential breakpoint condition 2]command....101
MEM command....151
Memo Commands....151
MEMO.PT....45, 107
[Memory]command....91
[Memory]window....88
Local menu....69, 89
Mouse Operations....89
Shortcut Keys....88
[Memo]window....107
Local menu....70, 109
Shortcut Keys....107
Menus....64
Message file....44
Miscellaneous....19
MLIST command....152
MLIST> command....152
Model-specific definition file....39, 45, 46, 52
[Module]command....64, 83
[Module]dialog box....122
MON101C.EX....44, 48
Monitor program....44
Mouse Operations....77, 78
[BackTrace]window....97
[Break]window....102
[Code]window....84
[Inspect]window....106
[Local]window....95
[Memory]window....89
[Register]window....91
[Watch]window....99

N

N command....149
Necessary Hardware....11
Necessary Software....12
NEM101C.HLP....45
[Next]command....66
NLIST command....151
Numerical Values....133

O

[Offset]command 95
On-the-Fly Support 15, 19
Operators 141
[Option]dialog box 47
OPTION command 151
[Option Set]command 73
[Options]menu 73
Other Files 45

P

P command 84, 145
Package Contents 9
[Paste]command 65, 87, 109
[PC Location]command 83
Performance Evaluation Functions 15
PF/PRINTF command 149
PICE101C.ENV 44
PICE101C.ENV 39, 41, 45, 46, 48, 52
Powerful Data Display/Editing Functions 14
Predefined Symbols 152
Preface 8
Preparing for installation 26
PRMPT command 151
PROF command 147
PT101C.DAT 45

R

R command 148
[Radix]command 106
Radix Command 149
[RAM Monitor]window 110
Local menu 71, 111
Shortcut Keys 110
[Range]command 106
RD command 149
Reading/Writing Files 149
README.WRI 27
Real-Time Tracing Commands 146
[Register]dialog box 125
[Register]window 90
Local menu 69, 91
Mouse Operations 91
Shortcut Keys 90
[Reload]command 64, 87
REPEAT{ command 152
[Reset]command 64, 87
RESET command 145
[Resize]command 73
Right button click 77
ROM and RAM 17
Run Installation Program 27
[Run]menu 67
Running User Program Commands 145

S

S command 149
SALL command 151
[Save Setting]command 101
Save setup 37
Create a New Environment 40
Modifying an Existing Environment 43
Upgrading from MS-DOS<R>Version 42
Saving[Command History]window contents 45
Saving[Memo]window contents 45
Scope of C Variables 140
Screen Control/Miscellaneous Commands 151
Screen Display 62
Screen Layout 60
[Search]menu 66
[Select Color]command 73
Select working directory 37
Creating a New Environment 39
Upgrading from MS-DOS Version 41
[Set Data]dialog box 125
[Set Inspect data]dialog box 121
[Set line no.]dialog box 122
[Set Software Break point]command 67

[Set Software Breakpoint]dialog box 127
Set Up Environment 37
Creating a New Environment 39
Modifying an Existing Environment 43
Upgrading from MS-DOS Version 41
[Set Watch data]dialog box 121
Setting Options 151
[Short Floats]command 89
Shortcut Keys 74
[BackTrace]window 96
[Break]window 100
[Code]window 81
[Command]window 85
[Inspect]window 105
[Local]window 94
[Memory]window 88
[Memo]window 107
[RAM Monitor]window 110
[Register]window 90
[Stack]window 92
[Trace]window 103
[Watch]window 98
[Single step]command 67
SM command 147
Software 17
[Source]command 83, 97
Specify starting options
Create a New Environment 40
Modify an Existing Environment 43
Upgrading from MS-DOS<R>Version 42
[Stack]window 92
Local menu 69, 92
Shortcut Keys 92
[Start]menu 31
Starting Options 47
Specifying Starting Options via Command Line 48
Specifying Starting Options via Dialog Box 47
Starting options file 44
[Status Bar]command 66
Status Bar 116
Strings 135
Structural Elements 60
[Symbol]command 91
[Symbols]command 92
Symbols 131
System Commands 149

T

T command 84, 145
TD command 146
TDW command 146
TG command 147
TI command 147
[Tile]command 72
TIME command 151
TM command 147
[Tool Bar]command 66
[Tool Bar]dialog box 118
Tool Bar 112
Tool Bar Configuration 112
[Top]command 83, 104
Trace Functions 15
[Trace Go/Trace Stop]command 104
[Trace]window 103
Local menu 71, 104
Shortcut Keys 103
Tracing 18
TRIG command 147
TS command 147

U

U command 81, 82, 150
UEND command 150
[Undo]command 65, 109
[Until Return]command 67
UPOP command 150
UPUSH command 150

User Customization 14
[User Save]command 72
[User1]command 72
[User2]command 72
[User3]command 72
Using Debugger for First Time 36
UX command 150

V

V command 81, 82, 150
VAL command 82, 151
[View]command 106
[View]menu 66

W

W command 81, 150
W? command 150
WAIT command 151
[Watch]command 83, 95, 99, 106
[Watch]window 98
  Local menu 70, 99
  Mouse Operations 99
  Shortcut Keys 98
WHILE{ command 152
WICE101C.HLP 45
WICE101C.INI 44, 48
Window
  Specific Mouse Operations 78
  Specific Shortcut Keys 76
[Window Bar]command 66
Window Bar 115
Window Commands 59
[Window]menu 72
Windows 95 Installation 31
Windows initialization file 44
Windows V3.1 Installation 28
WM command 150
[Word]command 89
Working directory 37
WR command 149

X

X command 150

Y

Y command 150

Z

[Zero]command 91
[Zoom in/out]command 111

MN101C00 Series
C Source Code Debugger for Windows®
User's Manual

October, 1999 1st Edition 2nd Printing

Issued by Matsushita Electric Industrial Co., Ltd.

© Matsushita Electric Industrial Co., Ltd.

Semiconductor Company Matsushita Electronics Corporation

Nagaokakyo, Kyoto, 617-8520 Japan
Tel: (075) 951-8151
http://www.mec.panasonic.co.jp

SALES OFFICES

■ U.S.A. SALES OFFICE

Panasonic Industrial Company [PIC]

- **New Jersey Office:**
  2 Panasonic Way, Secaucus, New Jersey 07094
  Tel: 201-392-6173
  Fax: 201-392-4652
- **Milpitas Office:**
  1600 McCandless Drive, Milpitas, California 95035
  Tel: 408-945-5630
  Fax: 408-946-9063
- **Chicago Office:**
  1707 N. Randall Road, Elgin, Illinois 60123-7847
  Tel: 847-468-5829
  Fax: 847-468-5725
- **Atlanta Office:**
  1225 Northbrook Parkway, Suite 1-151,
  Suwanee, Georgia 30174
  Tel: 770-338-6940
  Fax: 770-338-6849
- **San Diego Office:**
  9444 Balboa Avenue, Suite 185
  San Diego, California 92123
  Tel: 619-503-2940
  Fax: 619-715-5545

■ CANADA SALES OFFICE

Panasonic Canada Inc. [PCI]
5700 Ambler Drive Mississauga, Ontario, L4W 2T3
Tel: 905-624-5010
Fax: 905-624-9880

■ GERMANY SALES OFFICE

Panasonic Industrial Europe G.m.b.H. [PIEG]

- **Munich Office:**
  Hans-Pinsel-Strasse 2 85540 Haar
  Tel: 89-46159-156
  Fax: 89-46159-195

■ U.K. SALES OFFICE

Panasonic Industrial Europe Ltd. [PIEL]

- **Electric component Group:**
  Willoughby Road, Bracknell, Berkshire RG12 8FP
  Tel: 1344-85-3773
  Fax: 1344-85-3853

■ FRANCE SALES OFFICE

Panasonic Industrial Europe G.m.b.H. [PIEG]

- **Paris Office:**
  270, Avenue de President Wilson
  93218 La Plaine Saint-Denis Cedex
  Tel: 14946-4413
  Fax: 14946-0007

■ ITALY SALES OFFICE

Panasonic Industrial Europe G.m.b.H. [PIEG]

- **Milano Office:**
  Via Lucini N19, 20125 Milano
  Tel: 2678-8266
  Fax: 2668-8207

■ HONG KONG SALES OFFICE

Panasonic Shun Hing Industrial Sales (Hong Kong) Co., Ltd. [PSI(HK)]
11/F, Great Eagle Centre, 23 Harbour Road,
Wanchai, Hong Kong.
Tel: 2529-7322
Fax: 2865-3697

■ TAIWAN SALES OFFICE

Panasonic Industrial Sales Taiwan Co.,Ltd. [PIST]

- **Head Office:**
  6th Floor, Tai Ping & First Building No.550. Sec.4,
  Chung Hsiao E. Rd. Taipei 10516
  Tel: 2-2757-1900
  Fax: 2-2757-1906
- **Kaohsiung Office:**
  6th Floor, Hsien 1st Road Kaohsiung
  Tel: 7-223-5815
  Fax: 7-224-8362

■ SINGAPORE SALES OFFICE

Panasonic Semiconductor of South Asia [PSSA]
300 Beach Road # 16-01
The Concourse Singapore 199555
Tel: 390-3688
Fax: 390-3689

■ MALAYSIA SALES OFFICE

Panasonic Industrial Company (Malaysia) Sdn. Bhd.

- **Head Office: [PICM]**
  Tingkat 16B Menara PKNS PJ No.17,Jalan Yong
  Shook Lin 46050 Petaling Jaya Selangor Darul Ehsan
  Malaysia
  Tel: 03-7516606
  Fax: 03-7516666
- **Penang Office:**
  Suite 20-17,MWE PLAZA No.8,Lebuh Farquhar,10200
  Penang Malaysia
  Tel: 04-2625550
  Fax: 04-2619989
- **Johore Sales Office:**
  39-01 Jaran Sri Perkasa 2/1,Taman Tampoi
  Utama,Tampoi 81200 Johor Bahru,Johor Malaysia
  Tel: 07-241-3822
  Fax: 07-241-3996

■ CHINA SALES OFFICE

Panasonic SH Industrial Sales (Shenzhen) Co., Ltd. [PSI(SZ)]
7A-107, International Business & Exhibition Centre,
Futian Free Trade Zone, Shenzhen 518048
Tel: 755-359-8500
Fax: 755-359-8516

Panasonic Industrial (Shanghai) Co., Ltd. [PICS]
1F, Block A, Development Mansion, 51 Ri Jing Street,
Wai Gao Qiao Free Trade Zone, Shanghai 200137
Tel: 21-5866-6114
Fax: 21-5866-8000

■ THAILAND SALES OFFICE

Panasonic Industrial (Thailand) Ltd. [PICT]
252/133 Muang Thai-Phatra Complex Building,31st
Fl.Rachadaphisek Rd.,Huaykwang,Bangkok 10320
Tel: 02-6933407
Fax: 02-6933423